2. After the publication of Müller's work, various physical theories of secretions were held. At first, it was thought to be a mere transudation through the basement-membrane; but when chemical differences were found in the products of secretion, these had to be taken into account. At that time, nothing was known about cells and their action. Afterwards, Dutrochet's theory of diffusion was applied to the explanation of secretion; and this diffusion must, no doubt, still be taken into account, though with modifications. Wollaston supposed that secretion might be a mode of diffusion modified by electric action. It was now known that glands presented electric variations, but no one held electricity to be a sufficient cause of secretion. Another physical theory was that of vascular pressure; but this, as was noted in the second lecture, had been shown by Ludwig to be incorrect. In many glands secretion was intermittent, though the blood-pressure was constant, and the secretion from the submaxillary gland continued when the pressure was cut off, and even when the heart of the animal was removed.

3. The third class of theories consisted of those relating to the action of the secreting cells. It might have been supposed that, after Schwann's investigations, the cell would have early had a place assigned to it in the function of secretion; but this could not be done until the nature and function of the cell was understood. It had even been thought that the cells lay loose within the glands, and that any changes which they might produce in the secretion were merely accidental. But, gradually, the importance of the cell and of its contents in the elaboration of secretions was recognised. No definite idea regarding this, however, had been formulated till late years. The first theory, the endosmotic theory, was put forth by Hering, of Prague, in 1872. He thought that the cells of the submaxillary gland contained a colloid substance, which became swollen up in consequence of the inhibition of fluid. He thought that the protoplasmic cells could form mucin; that this absorbed water, causing enlargement of the cells, which gave out their contents; that then mucin was again formed, and the process was repeated. In this way, pressure on the gland was produced; and Hering thought the flow of secretion might also thus be explained. From experiments on the parotid gland, Hering found that saliva was secreted under less pressure than in the case of the submaxillary. There were no powerful facts against Hering's theory, except the intermittent character of the secretions, and the fact that, in cases of paralysis of the nerves of the submaxillary gland, where secretion went on constantly, no mucin was found. Heidenhain was disposed to adopt Hering's theory with some modifications. He pointed out the necessity of assuming the active co-operation of the protoplasm of the cells, and held that the variations in secretion produced by the influence of nerves depended on differences in the power of the cells to resist the flow of fluid from them. *Amœbæ*, while alive, resisted the absorption of fluid; and, conversely, cells might resist discharge of fluid from them. Heidenhain supposed that, when division of a nerve was attended by increased secretion, it was in consequence of the power of the cells to resist the outflow being diminished. Contraction of the protoplasm of cells might also occur under the influence of nerves; but this had not been made out. Stricker and Spina had put forth a theory which tended to reverse all previous ideas. Engelmann had found that the cells of the glands in the frog's foot were, while in a state of rest, either flattened against the membrane or slightly prominent; but that, when the sciatic nerve was excited, the cells became enlarged, and projected into the gland, which also contracted, so that the lumen almost entirely disappeared. Engelmann believed that the contraction was due to the action of muscular fibres, and that the increase in thickness of the cells was produced by contraction of the gland, the changes in the cells being analogous to those met with in the epithelium of the urinary bladder, according to its state of distension or emptiness. Two or three years ago, Stricker and Spina investigated the glands in the foot and in the transparent lower eyelid of the frog. They found some of the cells flattened, others filling up the cavity of the glands like a plug; also that, when an electric shock was passed through the limb, the flattened cells became swollen, and the plug-like condition was increased. But they denied that muscular action had any effect in reducing the size of the epithelial cells, and said that, when the gland enlarged, the cells were flattened against the membranous layer, and the secretion was poured out into the lumen of the gland. They believed that the condition was not one of contraction, but rather of relaxation of the cells, with a passage of water into them, followed by contraction, which forced the fluid contents into the lumen of the gland. The lecturer had observed enlargement of the gland-cells during excitation of the nerves; but there was always some diminution of the gland, mostly in a direction from above downwards, in the course of the muscular fibres. Of course, this contraction could not

be well seen, except when the gland was displayed in longitudinal section, which was often difficult. Stricker and Spina desired to apply their theory to all glands, including the salivary; they said that, if atropin were given, and the nerve irritated, there was no secretion; but, if the glands in the frog were at once stimulated, some secretion took place. Mr. Schäfer found that small doses of atropin (about two milligrammes) were sufficient to paralyse the chorda tympani, and to prevent secretion under direct irritation. Further, the results obtained by Stricker and Spina from the use of atropin in frogs differed from those in man, frogs being less susceptible to the action of atropin. The lecturer thought that the theory of Stricker and Spina must be rejected, so far as regarded the salivary glands; but no doubt somewhat different results were produced in the glands of the frog's foot from those observed in the glands of other parts.

4. The next theories for consideration were those concerning the influence of nerves. Heidenhain drew attention to the differences produced by exciting one or the other set of nerve-fibres supplying the gland. In the parotid gland, irritation of Jacobson's nerve was followed by an increase of watery secretion, while irritation of the sympathetic produced accumulation of organic matter. He believed that there were two sets of fibres, the secretory, and the nutritive or trophic; the former coming from the cerebro-spinal system, the latter from the sympathetic. But it was by no means certain that secretory fibres had not a trophic action; and there was no doubt that irritation of trophic fibres might produce the result attributed to the others. Langley and Heidenhain had spoken of three changes as being produced: *a*, a growth of protoplasm; *b*, transformation of protoplasm into secretory products; *c*, increase of fluid. The lecturer, however, thought that the fact of an increased growth of protoplasm had been much exaggerated; and that the enlargement of cells after irritation was the result, not of growth of protoplasm, but of the formation of secretory products within the protoplasm. It was agreed that the next effect was a discharge of the secretory products, which might or might not take place at the same rate as the enlargement; if at the same rate, the cells retained their size. The assumption of the growth of the protoplasm appeared to depend on the idea that the secretory products were formed *from* protoplasm, whereas they were probably formed *by* it. In regard to the formation of tissues, there were two views: *a*, that held by Beale and others, that all tissues must first have been protoplasm; *b*, that the tissues were formed by protoplasm. All that could be said was, that it was not yet possible to form a satisfactory theory on this point, one that should be applicable both to secretion and to nutrition. Lastly, the fact must be recognised that changes took place in glands during secretion, similar to those which occurred in other organic structures; such as the formation of heat, the evolution of carbonic acid, and electric changes.

A CASE OF SYPHILIS, IN WHICH ATAXY AND OTHER NERVOUS DISORDERS OCCURRED AT AN UNUSUALLY EARLY PERIOD.

By T. CHURTON, M.D.,

Physician to the Leeds General Infirmary.

JOHN P., aged 24, of medium size, light hair and complexion, normal weight 11 st. 6 lbs., but now reduced to 10 st., a groom, able when in health to ride any horse, to walk thirty miles a day, and to endure long abstinence from food, accustomed to drink rather heavily both of beer and spirits, was admitted into the Leeds Infirmary on December 19th, 1884. He was quite unable to walk; he could stand, even when supported on both sides, with great difficulty, anxiously looking down all the while at his legs, and so tending to fall forwards, being unable to balance his trunk upon his lower limbs. He had also lost power of coordinate movements in his upper limbs; could not cut up his food; could not even pick up a match without great trouble and bungling; he could not, moreover, tell by mere sense of touch what the match was. His grasp was, however, not very feeble; he complained of numbness and "pins and needles" in his fingers, especially in those of the left hand. He had similar abnormal sensations in his feet, especially in the left. His replies to questions were hazy, and, when repeated, variable; he seemed rather dazed. There was no tenderness nor swelling of bones and joints; no special wasting of muscles. The plantar and patellar reflexes were absent; the cremasteric and abdominal present; the pupils, optic discs, and retinae were normal. Hearing, etc., was not notably altered. The urine, on being heated, gave a marked phosphatic cloud. The organs of supply, circulation, and elimination were not particularly affected; he stated, however, that he had suffered a few weeks previously from

epigastric and abdominal pains, with some giddiness. In the right groin was a dusky red scaly rash; on the inner side of the right thigh was a similar, but much larger patch; on the penis, a cicatrix was found.

At first denying syphilis, he subsequently gave the following history. At seven years of age, he had rheumatic fever, but no other illness until two years ago, when he had gonorrhoea; sixteen weeks ago, he had a chancre, followed by an enlarged gland in his left groin; three weeks later, he had a sore-throat and a rash on the neck; he was then treated for syphilis, but not continuously. His parents are alive, but ailing; in his family, there is neither nervous disease nor phthisis. Five or six weeks ago, his right toes began to be numb and tingling; he staggered when he walked; the numbness spread up the leg; then the left foot and leg became affected; he was obliged to look at his legs when walking; he could not stand with his eyes shut or in the dark. At this time, he was still drinking rather freely. A fortnight ago (December 5th) he was quite unable to walk. Ten days ago his hands became numb and weak.

Upon this history being gained from him, mercurial inunction was at once begun; one drachm of blue ointment being rubbed in daily. He was kept at rest, had good food and no alcohol. He improved rapidly, so that on January 10 he could walk fairly well, could stand for a few moments with closed eyes, could cut up his food, grasp the dynamometer (right 53, left 51), distinguish two points of the aesthesiometer on the finger tips at a quarter of an inch from each other, and at one inch distance on the instep. The plantar and patellar reflexes were still absent. The inunction was continued until January 17th. He was discharged almost well on the 21st. A month later, the reflexes were normal.

Though the leading and most prominent clinical features of this case were thus finally seen to be those of locomotor ataxy, or posterior sclerosis, it cannot be taken as a simple case of that disease. The patient could neither walk nor stand at all, eyes shut or eyes open; so that, though he looked constantly at his legs when supported in the erect position, the sight of them did not help him. The equilibrating organ could not avail itself of information, reaching it through any channel. The really noteworthy feature of this case, however, is beside its accurate pathology. For the patient, having been quite well four months previously to admission and having then contracted syphilis, presented distinct symptoms of serious nervous disorder two months afterwards. I have previously seen nothing so rapid as this, except upon a single occasion.

Some years ago a similar case came under my observation. A young man, within a few months of his having contracted syphilis, presented, in addition to complete ataxy, certain specific signs which John P. did not present—for example, paralysis of the third nerve on one side. In him, perfect recovery ensued upon the very vigorous use of mercurial treatment, moderate treatment having been found wholly ineffective. Some authorities state that nervous diseases due to syphilis are not to be expected until from three to eighteen years have elapsed since the syphilis was acquired; but neither are changes in the arteries expected until after an equal lapse of time, yet cases have been recently recorded by Dr. Sharkey and M. Leudet, in which arteritis has followed the original sore in a few months. Now this question of the lapse of time appears to be one of some importance, for I do not remember ever to have seen a case of ataxy occurring many years after even indisputable syphilis, in which strong anti-syphilitic treatment has done any good whatever; early cases, on the other hand, seem to require very decided treatment. The reason why later cases are unaffected by that treatment has appeared to me to be that, during the interval, other causes of disease, perhaps several, or even many, have come into operation, and, aided to some extent by the specific taint, have brought about a condition of the nerves and sheaths which the syphilis alone had shown itself, even when in full vigour, unable in these persons to achieve. In such circumstances, no simple treatment, no single drug, no one precaution, is sufficient, or scientific, or in accord with common sense. It has been shown, indeed, that even such compositely caused disorders are not, when treated early, at all hopeless. But the case now under consideration is one of syphilis affecting, at an unusually early period, motion slightly, and co-ordination of sensations and movements gravely. Such cases appear to be as easily curable by vigorous treatment, specific and otherwise, as the commoner form of localised paralysis, due to a simple gumma.

BEQUESTS AND DONATIONS.—Mr. Dennis Herbert, of Huntingdon, has bequeathed £200 to the Huntingdon County Hospital, £200 to the Earlswood Asylum for Idiots, and £100 to the Huntingdon Convalescent Hospital.

CONTROL OF THE LACTEAL SECRETION.

By J. STUART NAIRNE, F.F.P.S.

THE breasts of parturient women frequently give trouble from engorgement of the lactiferous vessels, and from other causes leading to tension and pain in these organs. The two following cases will illustrate the line of treatment I have followed for some years past under these circumstances, and which has never yet failed to afford me perfect satisfaction and my patients perfect ease.

CASE I.—Mrs. G., multipara, was confined of a dropsical and malformed dead child, at full time, on March 14th, 1885. The breasts, which had been small and hard before confinement, soon became engorged and swollen; and the patient was hot and feverish. Cloths moistened with whisky and vinegar were laid on the breasts, and 10 drops of the tincture of belladonna were given every hour. Within 24 hours, the throbbing, which had been very troublesome, had ceased; milk could be easily expressed from the nipples, and she complained of a very dry throat. When the throat began to become dry, the number of drops of the tincture was diminished. During 10 days she had this treatment; the last few days, 10 drops only three times a day; and by that time the milk had almost entirely disappeared, and the breasts were small and flaccid. They gave no further trouble.

CASE II.—Mrs. C. was confined of her second child on May 25th, 1885; it was very weakly, being born before its time. She had a rapid rush of milk to the breasts; and next day these organs were very much enlarged, tender, and hard, and the child could draw no milk from them, and was so weakly that I thought it would die. It was, therefore, fed with the spoon, and the tincture of belladonna was given internally, as in the first case. The breasts were supported, and gently rubbed from the circumference towards the nipple. Next day, she said she felt hardly any pain, and the milk could be easily expressed from the nipples. The belladonna was continued another day, by which time the breasts were so soft, and the milk was flowing so freely, that the child was quite able to take its own nourishment. The belladonna was then stopped, and the breasts have given no further trouble.

These are only two cases which I have described, because they have just occurred, and they point quite clearly to the powerful influence that belladonna has in modifying the secretion of milk. Of course, one might say that, after a few days, the breasts settle down of themselves to their work. Sometimes they do, and sometimes they do not. My observation points to the fact that poor women of their own accord fly to a hundred remedies to relieve them—seidlitz powders, castor-oil, rubbing with oil and various things, and exhausting the breast with some kind of apparatus; and frequently to no effect; and frequently, also, with no result, is belladonna applied externally. The worst suppurating breast ever I saw was one in which the extract of belladonna had been applied most faithfully. In fact, applied externally in any form, belladonna is most disappointing. It frequently fails to relieve pain, take out the heat, or reduce the secretion of milk; and the cleanest of its applications is dirty. The smell, too, is frequently exceedingly offensive to the patient. Belladonna given internally is at once cleanly and effective; and I believe that, administered with judgment and careful watching of its effect, it is a specific for such congested conditions of the mammary organs.

BEQUESTS.—Mr. John Eden, of Beamish Park, has bequeathed £10,000 to the Durham Infirmary, £5,000 to the Royal Albert Asylum for Idiots and Imbeciles of the Northern Counties, £2,000 to the Brompton Cancer Hospital, £500 to the Royal Isle of Wight Infirmary at Ryde, £200 to the Gateshead Infirmary, and £200 to the Ramsgate and St. Lawrence Royal Dispensary.—Mrs. Mary Ann Blundell, of Alexandra Road, St. John's Wood, has bequeathed £100 to the British Home for Incurables, Clapham Rise.

BRADFORD MEDICO-CHIRURGICAL SOCIETY.—The annual meeting was held on June 2nd, and the following officers were elected. President, Dr. Goyder; vice-president, Mr. W. H. Ellis; council, Mr. Mossop, Mr. Miall, Dr. Craig, and Mr. Hirst; treasurer, Dr. Dunlop; secretaries, Dr. Rabagliati and Mr. Wilmot; auditors, Drs. Foster and Whalley; pathologists, Messrs. Carter and Spence.

DEATHS FROM STARVATION.—The annual return just issued of the number of deaths upon which coroners' juries have returned a verdict of death from starvation, or accelerated by privation, in the metropolitan district, in the year 1884, shows a total of 37 cases. Of these, 26 were in the eastern, eight in the central, and two in the western, division of Middlesex. The remaining case was in the Greenwich division of Kent.