DIAGNOSIS.

The diagnosis was Addison's disease.

TREATMENT.

After the patient had been in hospital for three weeks it was decided, after some hesitation (owing to the fact that most patients affected with Addison's disease are very susceptible to cold, and that the weather at that time in Edinburgh was very cold and inclement), to try the effect of open-air treatment. The patient was placed on the balcony outside the ward. The weather at the time, as has been already stated, was cold and inclement, wet, windy, stormy, and sometimes a sharp frost at night. The patient stood the exposure well; he felt quite comfortable, and did not complain of cold. At the same time, suprarenal extract (5 gr., three times daily) was administered.

RESULT OF TREATMENT AND SUBSEQUENT PROGRESS OF THE CASE.

Remarkable improvement resulted from the open-air treatment. The patient gained 1 st. 6 lb. in weight; the pigmentation of the skin and the asthenia became markedly less. He was discharged from hospital on 21st March, 1904.

After his discharge he presented himself from time to time as an out-patient, and on each occasion expressed himself as feeling well. Soon after I last saw him (November 23rd, 1904) he returned to work (he was a steward on board a ship) without asking my permission to do so.

On Friday, February 24th, 1905, while on board ship returning from the Baltic, he complained of great weakness and inability to do his work. On Saturday, the 25th, he was able to move about and attend to his duties. About 5 p.m. on that day he asked for whisky, saying "I am done for now"; he went to his bunk and lay down. On Sunday, the 26th, he appeared to the captain to be unconscious—he did not respond to questions and was unable to take nourishment. The ship arrived at Mentrose on Sunday, the 26th, at 5 p.m. Dr. Middleton Connon, to whom I am indebted for these particulars, was at once called to see him, but found, at 5.45 p.m., that he was dead. The final attack and death seem to have been due to rapidly developed asthenia and failure of the heart's action, perhaps the result of auto-intoxication—a not uncommon cause of death in Addison's disease. There was, unfortunately, no *post-mortem* examination.

REMARKS.

This history is very interesting and very important. It shows that in Addison's disease, even when marked improvement takes place, the patient's life, owing to the abolished function of the suprarenal glands, is an extremely precarious one. There can be no doubt, I think, that patients who have greatly improved, or apparently recovered from Addison's disease should lead inactive lives; the fact should be impressed upon them that they are not cured, that although greatly improved the disease is still in existence, and that any strain or over-exertion, anything likely to depress the heart's action, such as diarrhoea, exposure to cold, etc., may be attended with great danger.

The improvement which resulted from the open-air treatment (together with the administration of suprarenal extract) in this case was remarkable, and suggests that a further trial should be given to the treatment in cases of Addison's disease. It is probable, however, that it is only in a certain proportion of cases of Addison's disease that the treatment can be satisfactorily borne. In the only other case in which I have had the opportunity of employing the treatment—that of a ploughman, aged 25, who was admitted to the Edinburgh Royal Infirmary on March 13th, 1905—the treatment was not successful. In that case all the symptoms of Addison's disease were extremely well marked—I have never seen more marked pigmentation of the skin and buccal mucous membrane than there was in this (second) case. This patient was unable to bear the exposure in the inclement, variable weather which we were at that time experiencing in Edinburgh; the open-air treatment consequently had in his case to be given up.

I may say that in this second case there was no anaemia; the red blood corpuscles numbered 5,300,000, the white blood corpuscles 8,800 per c.cm., and the haemoglobin equalled 80 per cent. The condition of the blood in this case was interesting, since Addison himself laid stress upon anaemia as a symptom of the disease; Sir Samuel Wilks has, however, pointed out that in this respect Addison's description was erroneous. My own experience confirms Sir Samuel

Wilks's observations, for in most of the cases of Addison's disease which have come under my notice, the lips, gums, and conjunctivae were well—indeed, in several cases deeply—coloured.

I may also add that in this second case, as in the first case, analysis of the stomach contents showed the complete absence of free hydrochloric acid.

A CASE OF TUMOUR OF THE SPINAL CORD
REMOVED BY OPERATION.

A REVIEW OF THE CHIEF DIAGNOSTIC POINTS, VARIETY, AND OPERABILITY OF TUMOURS MET WITH IN THIS REGION.

By BERNARD J. WARD, F.R.C.S. ENG.,

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THE following case is interesting, both from its comparative rarity and from the difficulty in diagnosis which it presented.

R. W., aged 24 years, a spring maker, was admitted into the St. Marylebone Infirmary on August 14th, 1903, complaining of pain in his back.

Family History.—His mother died of cancer; there was no history of consumption.

History of Present Illness.

Eight years before he had fallen downstairs, striking his back as he fell; the pain soon passed off, and the following day he was about as usual, and free from pain. Four months later he began to suffer with dull aching pain in the lower part of his back; this pain was constant, worse at night, increased by stooping, and especially severe on raising the body from the stooping to the upright position, and in every way resembled lumbago; for which, as a matter of fact, he was treated in the institution for three months, at the end of which time he was discharged as cured. He then remained quite free from pain for two years, when a series of exactly similar attacks began; these attacks would last for about two weeks at a time, incapacitating him from work for the time being, recurring about every three months, and spread over a period of five years. In January, 1903, seven months before admission, the pain became worse, but still remained localized to the lumbar region of the spine; he had to give up his work altogether, and had the greatest difficulty in getting up and down stairs, which he could only do a step at a time. He described the pain "as feeling as if the spine was being compressed in a vice"; he could not lie down, for that made the pain worse, and he always slept propped up in bed. Six months before admission he had what he called a hard sore on his glans penis, but did not consult a doctor about it; there was no discharge from it, and no buboes, rash, or sore throat followed. He had a breaking-out on his legs soon after, and there are some coppery stains there now. There is a well-marked depressed scar on the glans penis, which is more like that left by a soft sore. On August 14th, 1903, he was again admitted into the St. Marylebone Infirmary, and at that time had slight weakness of the legs, but said that sensation in them was perfect. He was kept in bed for two weeks, and then allowed up for a few hours daily, when he noticed that his legs were rather weaker than on admission, especially the right; some days later, while walking along the passage, his knees suddenly gave way under him and he fell forward; he was unable to get up by himself, but after being picked up he managed with assistance to walk back to his bedside; afterwards he got up in the wheel-chair only, and noticed, whenever he rested the ball of his right foot on the foot-board with his heel clear, that clonic spasms of the calf muscles would take place, shaking his whole body; a week or so later the left leg began in the same way, and about this time, too, his legs first began to get stiff, and he noticed numbness in the groins, with shooting pains round his body and girdle sensations; the numbness gradually spread down his legs, and for some time he could feel better below the knees than above; he was at this time having the faradic current, and so had frequent opportunities for testing his sensation. From this time until the following notes were taken the pains in the back persisted, with shooting pains and girdle sensations round the body from the upper lumbar region behind to a point midway between the pubes and the umbilicus in front.

The following notes were taken on October 20th, 1903:

The patient has marked spastic paraplegia, with no voluntary control of any muscle in either lower limb; the spasticity

is so marked that on attempting to abduct one leg the other leg and pelvis follow. The knees bend like a piece of lead piping. He is quite unable to sit up in bed or raise himself without help, or even to turn on his side. On throwing the rectus abdominis into action the umbilicus is markedly drawn up, showing that the lower part of the muscle is much weakened. His legs are often spasmodically drawn up, causing pain in the back, and he is quite unable to lower them again without assistance.

Reflexes.—Tendon reflexes are clonic. Superficial reflexes—Babinski's sign present both sides; cremasteric, absent; lower abdominal, absent; epigastric, present. The arms are in every respect normal.

Sensation is not entirely lost, but very numb and delayed all over both legs; upper limit reaches midway between the pubes and the umbilicus, and passes thence more or less horizontally round the body, crossing the crest of the ilium, and joining the mid-line behind about the third lumbar spine. Heat and cold can be distinguished, but are also delayed.

Spine.—There is pain on movement in the upper lumbar and lower dorsal regions, there is also pain in the same region on tapping the spines of the vertebrae, most intense over the ninth and tenth dorsal spines; there is also pain in this region on jarring the head in a downward direction. There is rigidity in the lower two-thirds of the dorsal region and in the lumbar spine. There is a slight kyphotic curve involving the spines of the seventh, eighth, ninth and tenth dorsal vertebrae, the ninth and tenth being especially prominent. For the last two days there has been a patch of oedema over the sacrum and lower dorsal vertebrae.

Sphincter.—He has difficulty in starting micturition. He has no incontinence of urine and can hold his urine well. There is incontinence of faeces when liquid.

Eyes.—The pupils react well to light and accommodation, the fundus is normal, there is no nystagmus and no paralysis of any ocular muscle.

Progress.—The patient has been treated with gradually increasing doses of potassium iodide up to 90 gr. daily combined with mercury during the last three weeks, but has become worse, sensation being now completely lost in both legs up to a point midway between the pubes and the umbilicus. The pain and cramp-like spasms of the muscles are undiminished.

Operation.

On November 12th, 1903, having decided to remove the ninth and tenth dorsal spines and laminae, a free incision with these spines for a centre was made. Preliminary intramuscular injections of adrenalin chloride were made into the erector spinae in several situations on either side of the intended incision, and this I found to be a very valuable help in the subsequent steps of the operation, the bleeding, which is usually very profuse in these operations, being easily controlled. The spines and laminae of the ninth and tenth dorsal vertebrae were separated with saw and bone forceps, and as soon as they were removed the dura mater bulged through the opening. It was then seen to look like a cyst filled with transparent fluid, through which the posterior surface of the cord could be dimly seen. On palpating the cord a tumour could be felt almost entirely filling the canal. The dura mater was now incised, when immediately fluid under great pressure gushed out, and the posterior roots protruded through the opening thus made; when the first gush of fluid had lessened fluid was also seen to be spurting out in a tiny stream from between the strands of the posterior roots; no tumour was to be seen, but it could be felt as a distinctly localized growth about the size of a walnut, quite hard, covered in by the posterior roots which were stretched over it, and situated somewhat more on the right side than the left, the cord itself was not to be seen, being completely covered in by the roots. The strands of these roots were carefully separated with a director and the tumour exposed, it was then shelled out quite easily by suitably curving the director and passing it round the tumour in all directions, care being taken to keep it pressed against the tumour so that no damage should be done to the cord. Free oozing followed and immediately filled the cavity from which the growth had been removed, so that the cord itself could not be seen, and as the patient was now rather collapsed no time was wasted in examining the cavity, but owing to the size of the tumour the cord could not have been much thicker than a piece of ribbon. The dura mater was closed by a continuous fine catgut suture, and the wound closed except for a drainage tube. The wound healed by first intention, but there was a

discharge of cerebrospinal fluid from the drainage-tube hole for three weeks afterwards. At first this was very profuse, soaking the dressings through in a few hours, but gradually lessened.

After-Progress.

The following morning the patient was still completely paralysed in his legs, but the previous spastic paraplegia had given place to an absolutely flaccid one with loss of knee-jerks. For two weeks following the operation he had retention of urine, which gradually gave way to complete incontinence. Anaesthesia was absolute and to the same level as before operation, plantar reflex extensor. He had complete relief from the distressing pain in his back and round his body.

His condition remained practically the same until his death twenty months later from extensive bedsores, except that contractures developed. He had not had any recurrence of his pain, and was very cheerful and thankful for what had been done. He used to get about in the wheel-chair.

The Tumour.

The tumour had evidently grown from the posterior root sheaths, which is a very frequent site for these growths. It weighed 75 gr. Microscopically it was a fibro-sarcoma evidently of slow growth, from the large amount of fibrous tissue in it, and from the fact that it was entirely encapsuled.

Post-mortem Examination.

A necropsy was made by Dr. Gordon Holmes on June 18th, 1905. The following is an extract from his notes:

Scar extended from the ninth dorsal vertebra to first lumbar spine. The laminae of the tenth and eleventh dorsal vertebrae had been removed, and the space was filled up by firm fibrous tissue, on dissecting off which a large cyst was felt in the position of the laminae, and the vertebral canal was here enlarged by absorption of the bone of the vertebral pedicles by pressure.

The cord was normal except for ascending degeneration in the posterior columns down to the level of the tenth dorsal segment; here the dura mater became adherent to the pia arachnoid, and was tightly bound down to the cord. From the lower part of the eleventh dorsal segment to the third lumbar segment the dura mater was distended to form a large cyst containing clear fluid. The operation opening in the dura mater was closed by fibrous scar tissue, and it seemed to be owing to the stretching of this that the cyst formed.

The cord was normal in shape down to the eleventh dorsal segment: here it became contracted and flattened out, and at the level of the twelfth dorsal segment and first and second lumbar segments it was not recognizable until the whole was cut transversely, and then it was seen that these segments were completely disorganized, and bound down by the thickened pia arachnoid to the surface of the dural cyst. Below the third lumbar segment the cord was normal in shape, although softened in places. There was no evidence of any recurrence of the growth, either macroscopically or microscopically; all that remained of the cord at the site of pressure was a strip of fibrous tissue.

Diagrammatic post-mortem view of spinal cord, showing adhesion of cord to dorsal and left wall of cyst, which consisted of expanded dura. The tumour was reached at the operation by separating fasciculi of the posterior nerve roots. Approximate position of tumour dotted in. a, tumour; b, cyst, to the dorsal wall of which cord is adherent; c, dura; d, pia arachnoid; e, anterior nerve root; f, posterior nerve root.

It will be seen that the post-mortem report does not agree with the operative as regards the spine and laminae removed. I counted most carefully both before and after operation on several occasions, and was quite certain that those removed were the

ninth and tenth, and this would fit in more accurately with our knowledge of the relation of spine to segments of the cord. The cyst, of course, was not due to giving way of the fibrous tissue of the scar in the dura mater, as it was present at the time of the operation.

REMARKS.

The following table from Schlesinger gives the variety, site of origin, and position of 400 tumours of the spinal cord:

Variety.	Intradural.			Extradural.		Single.	Multiple.	Total.
	Medullary.	Meningeal.	Both.	Meningeal.	Non-Meningeal.			
Sarcoma ...	14	53	9	17	11	80	27	107
Tubercle ...	62	—	—	2	—	55	9	64
Echinococcus ...	—	5	—	39	—	8	36	44
Fibroma ...	—	20	2	5	—	15	18	33
Gumma ...	7	4	15	2	—	19	9	28
Glioma ...	20	—	—	—	—	20	—	20
Pseudomoma ...	—	18	—	—	—	18	—	18
Myxoma ...	—	7	—	4	—	11	—	11
Lipoma ...	1	8	—	—	1	8	3	11
Cysticercus ...	2	5	—	—	1	4	4	8
Glio sarcoma ...	—	3	4	—	—	4	7	7
Endothelioma ...	—	5	—	1	—	4	2	6
Melano-sarcoma ...	1	—	3	—	—	1	3	4
Neuroma ...	4	—	—	—	—	3	1	4
Lymphangioma ...	—	1	—	1	—	1	1	2
Cysts ...	—	1	—	1	—	1	1	2
Cholesteatoma ...	1	—	—	—	—	1	—	1
Uncertain ...	13	12	2	3	—	24	6	30
	125	142	35	75	13	273	127	400

This table shows that intradural tumours are more than three times as common as extradural ones, and of these intradural ones that medullary tumours are very nearly as common as extramedullary ones, and that nearly all these medullary ones are composed of inoperable tumours, as tubercle, sarcoma, and glioma.

The commonest variety of tumour is sarcoma, usually meningeal in origin and in 25 per cent. of cases multiple. Tubercle in all but two cases is medullary, and single in most cases; it most often occurs in children. An unusual number of gummata appear to be medullary, and the tumour is not nearly so frequent as it is in the brain; it occurs most frequently in middle age. Sarcoma is met with at any age. Echinococcus is much less common in this country than this table would lead us to suppose. Looking at these facts from an operative point of view, we may take it that a large number of the meningeal sarcomata, if taken early enough, would have been capable of removal; tubercle would not be benefited by operation, and fibroma could in all cases have been completely removed.

Operability of Tumours.—This depends on their nature and situation; intramedullary tumours are very rarely to be benefited by operation; meningeal ones, whether intradural or extradural, if taken early enough are capable of removal; as to whether the relief will be permanent or not can only be proved by following up the cases for some years after operation, but from the nature of the growths in many cases and from experience of operations on similar growths in other and more accessible regions of the body, one cannot but believe that recurrence is bound to take place in a large percentage of cases.

Collins has collected 70 cases from literature up to 1902; 30 of these cases were operated on; 12 of these operations were successful, 8 partially successful, and 10 were unsuccessful and the patient died. By success he means cessation of pain with recovery of motor power; by partial success, cessation of pain with slight recovery of motor power; and by unsuccess, death in a few weeks.

Of these 30 tumours operated on, 6 were fibromata (all except one of which recovered and that died of sepsis), 12 were sarcomata, 3 endotheliomata, and 1 myolipoma (also died of sepsis). The causes of death in the unsuccessful cases were sepsis 4, shock and haemorrhage 4, pneumonia 1. The successful cases do not seem to have been followed up, so that recurrence probably took place in some. The death-rate from sepsis and shock is very high. This gives an average of 40 per cent. of cures.

Starr (1904) collected 58 cases submitted to operation, in which the tumours were removed in all but 3; 16 were successful, 10 partially so, and 32 unsuccessful, which gives 28 per cent. of cures. The majority of the deaths were due to either shock and haemorrhage or sepsis.

It seems clear from the above statistics that the percentage of immediate recoveries should be considerably increased by cleanliness and quickness in operating and by earlier diagnosis. For it is obvious that the majority of partial recoveries would have been converted into complete ones by earlier operative interference before the delicate tissue of the cord had been irretrievably ruined by the prolonged compression; and if we take the successful and partially successful cases together as possible cures we get in Collins's cases 66 per cent., and in Starr's cases about 45 per cent. of cures. And, again, if we may reckon that those cases which died from sepsis and shock, and which will be saved in the future, as counterbalancing those in which recurrence is likely to occur, I think that 50 per cent. of complete cures will be as good as we can possibly expect.

The most important symptoms from a diagnostic point of view are the following:

Pain.—This is intense neuralgic, sharp-shooting, burning, and agonizing, persistent in one locality; the pain is not associated with tenderness over the nerve trunks, or tender spots on the skin. No other disease causes such definitely localized, recurring, and persistent pain. The pain is related to the segment first affected, and is at first unilateral, later becoming bilateral (a very important diagnostic sign). The painful areas are often hyperaesthetic, there is rarely any rigidity of the spine, and bending the back does not increase the pain. Pain is usually the first symptom to appear, and has often caused mistakes in diagnosis, patients having been operated on for appendicitis, gall stones, renal stones, and treated for angina pectoris, lumbago, and indigestion.

Motor Symptoms.—These are usually the next to appear, and take the form of spastic paraplegia, with increased tendon reflexes, imperfect control of bladder and rectum (the paralysis often being at first limited to one side, or more marked on that side).

Sensory Symptoms.—Anaesthesia soon follows to the level of the lesion. A typical Brown-Séquard paralysis may occur in the early stages, or dissociated anaesthesia.

In intramedullary tumours the paraplegia is usually not so complete, and pain is much less severe and rarely an initial symptom.

Diagnosis.—Starr says that this presents no difficulty, and should be made very early—in fact, as soon as spinal symptoms are associated with intense, persistent pain in one locality, at first often one-sided and later becoming bilateral; and the same applies to the motor symptoms, which are occasionally one-sided at first. When multiple tumours are present multiple pains will be present, and there will be a mixed paralysis with atrophy of the muscles supplied from each segment involved. It may be difficult to diagnose from caries in the early stage, but the appearance of marked deformity decides the question (Starr).

Treatment.—According to Schlesinger's table, gumma only occurs in 28 out of 400 cases. Valuable time may be lost in persevering with potassium iodide treatment, and if improvement does not soon appear with large doses of this drug operation should be resorted to. If the tumour is not removable the posterior nerve roots at, above, and below the involved segments should be divided to relieve the intense pain.

Localization.—Experience has proved that there is a great liability to locate the lesion too low in the cord. The level of the pain and the anaesthesia are the most reliable localizing signs, and in the dorsal region the lesion is usually situated about 4 in. above the upper level of the anaesthesia. A practical point to be borne in mind when operating is to remove the laminae opposite the highest point of the supposed lesion, and if not found to enlarge the wound upwards.

Although the operation in this case cannot be written down as an unqualified success, yet I think I may fairly call it a partial success, in that it undoubtedly prolonged his life and entirely freed him from his distressing pain; he was enabled to enjoy the remainder of his existence, and was, in fact, quite bright and cheerful, and managed to get himself about in the wheel-chair, and never, up to the last moment, gave up hope of again being able to walk.

From a diagnostic point of view the case was extremely interesting and rather difficult. The three conditions to be considered were: Syphilis (gumma), spinal caries with pressure paraplegia, and tumour of the cord.

The history of syphilis was indefinite, and the scar left on the glans much in favour of his trouble having been a chancroid rather than a Hunterian chancre; nevertheless, there was sufficient doubt to render a thorough course of potassium iodide and mercury necessary. The differentiation between caries and tumour was much more difficult, the pain, tenderness, and rigidity, coming on after an accident and accompanied by a decided kyphotic curve of an angular nature, built up a clinical picture of Pott's disease, and made this diagnosis extremely probable. As a matter of fact, that was the conclusion I came to in this case. The one great symptom in favour of tumour was the intense and persistent localized pain, and I am quite ready to admit that this should have put me on the track, the pain being much more marked than that occurring during the course of Pott's disease. Against tumour was the rigidity and tenderness of the spine, which we can now explain by the erosion of the vertebrae seen at the *post-mortem* examination.

Another extremely interesting point to me is the occurrence of a flaccid paralysis after the operation. One would expect a certain amount at least of spastic paraplegia to remain after the removal of the tumour, owing to the descending degeneration of the pyramidal tracts already set up by the pressure of the growth. I can only account for this fact by suggesting that either the sudden relief of tension in vessels which had for some time been compressed, and consequently damaged, led to thrombosis, and caused a previously incomplete lesion to become a complete transverse one, or that thrombosis occurred on the day in which he suddenly lost the use of his legs in the ward and fell down, the spastic condition being subsequently kept up by the irritation of the tumour.

I must here express my indebtedness to Mr. J. R. Lunn, Medical Superintendent of St. Marylebone Infirmary, for leaving the entire treatment of this case in my hands, and for much kindly advice in the subsequent preparation of my notes for publication. I have also to thank Dr. Gordon Holmes for his careful *post-mortem* examination and report of the condition of the spinal cord.

SEVENTY-THIRD ANNUAL MEETING

OF THE

British Medical Association.

Held at Leicester, July 24th, 25th, 26th, 27th, and 28th, 1905.

PROCEEDINGS OF SECTIONS.

SECTION OF PATHOLOGY.

F. W. MOTT, M.D., F.R.S., President.

A DISCUSSION ON THE RELATIONSHIP OF HEREDITY TO DISEASE.

I.—F. W. MOTT, M.D., F.R.C.P., F.R.S.,
Pathologist to the London County Asylums; Physician to Charing Cross Hospital.

THE resemblance of offspring to parents is a commonplace observation which may be stated in the formula "Like begets like," but as variations which make the offspring differ from the parents constantly occur, rendering the likeness incomplete, the formula is more correctly expressed as "Like tends to beget like."

The resemblance of the offspring to the parents or one parent in particular may be general or minute in physical and mental characteristics, and this applies not only to normal but to abnormal characters as well.

The ancients were quite familiar with the fact that the heritage of an individual is that of the stock from which the individual springs. Thus the theory of the continuity of the germ plasma is foreshadowed by Lucretius, who says: "Sometimes, too, the children may spring up like their grandfathers, and often resemble the forms of their grandfathers' fathers, because the parents often keep concealed in their bodies many first beginnings mixed in many ways, which, first proceeding from the original stock, one father hands down to the next father; and then from these Venus produces forms after a manifold chance, and repeats not only the features but the voices and hair of forefathers. And the female sex equally spring from the father's seed, and males go forth equally formed from the mother's body; since these distinctives no

more proceed from the fixed seed of one or other parent than our face and bodies and limbs, the birth is always formed out of the two seeds."

The inheritance of an individual may be compared to a mosaic built up from many ancestors; and Mr. Galton (who, independently of Weismann, disproved the Lamarckian doctrine of the transmission of acquired characters and the continuity of the germ plasma) showed that each parent contributes to the offspring one-fourth, and each grandparent one-sixteenth, and so on. So that any statistics of the relationship of heredity to disease, to be of value, should be based upon a family history including the grandparents, uncles, aunts, and first cousins, with the history of disease and cause of death of each. This is evident from a glance at the family tree in which there is a hereditary transmission of defective durability of some special tissues—for example, idiopathic muscular atrophy or hereditary ataxy; or in which there are inherited morphological defects of blastogenic origin—for example, Daltonism, haemophilia, polydactylism, deaf-mutism, albinism, etc.; conditions in which there can be no possible doubt as to their existence or not, therefore conditions which would be known to all the members of the family. Moreover, such instances of family disease offer the very best examples for the study of hereditary transmission, because the personal bias of the inquirer is reduced to a minimum, though not necessarily an irreducible minimum.

I will now throw on the screen some examples of Sanger-Brown's family of Friedreich's disease: Daltonism after

HEREDITARY HAEMOPHILIA.

HEREDITARY DALTONISM.