Leucocythemia, or white cell blood : in relation to the physiology and pathology of the lymphatic glandular system. / By John Hughes Bennett.

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LEUCOCYTHEMIA,

OR

WHITE CELL BLOOD.

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IN RELATION TO THE

PHYSIOLOGY AND PATHOLOGY OF THE LYMPHATIC GLANDULAR SYSTEM.

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WITH TWO COLOURED LITHOGRAPHS, AND NUMEROUS WOODCUTS.

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PREFACE AND DEDICATION.

In this Memoir I have described numerous examples of a remarkable alteration of Human Blood, which hitherto has always been found associated with a morbid condition of the Spleen, or other Glands of the Lymphatic System. The general conclusion to which my observations have led is, that these Glands secrete the Blood,—a circumstance which, if physiologically true, must lead to a more correct knowledge of the pathological relations existing between the one and the other. Further inquiry into this important subject demands the co-operation of that now numerous and earnest band of labourers who are investigating the Blood histologically, in conjunction with the Clinical History of Disease. To their exertions Rational Medicine in after-times will be largely indebted; and to them I respectfully dedicate the following pages.

JOHN HUGHES BENNETT.

Edinburgh, March 1852.

ERRATA.

Page 45, line 14 from top,—instead of "conjunctiva," read "*conjunctivæ*."

„ 46,—instead of "Figs. 1 and 2," read "9 *and* 10."

„ 80,—line 4 from bottom, instead of "her finger," read "*his finger*."

CONTENTS.

ON LEUCOCYTHEMIA.

INTRODUCTION.

On the 19th of March 1845, I examined the body of a man, who died under the care of Professor Christison, in the Royal Infirmary, labouring under hypertrophy of the spleen and liver, and whose blood was crowded with corpuscles which exactly resembled those of pus. The case was published in the "Edinburgh Medical and Surgical Journal," for October 1845, under the title of "Case of Hypertrophy of the Spleen and Liver, in which Death took place from Suppuration of the Blood." Dr Craigie, who was present at the dissection, recognised its similarity to one he had had under his care four years previously, the blood of which had been examined microscopically by Dr John Reid, who found "that it contained globules of purulent matter and lymph." It was from the January number of Schmidt's "Jahrbücher," for 1848, I first learned that Virchow had dissected a body in the Charité Hospital of Berlin, on the 1st of August 1845, in which the blood examined microscopically presented the same increase of colourless corpuscles, also associated with enlargement of the spleen. This case was originally published in the 780th Number of Froriep's "Notizen," under the name of white blood, or "Leukhemia." On the 31st of December 1845, a man was received into St George's Hospital, London, in whom Dr Fuller detected, both before and after death, the increased number of colourless corpuscles in the blood. This man, like the other individuals, had great hypertrophy of the spleen. A notice of

the case is inserted in the "Lancet," for July 1846. Since then several similar cases have been met with, in which this morbid condition of the blood has been determined to exist, by an accurate examination with the microscope; and a reference to the records of medicine has shown the previous occurrence of like cases. In these last, it is true, the blood was not physically proved to contain an unusual number of colourless corpuscles, although now, on looking back upon the facts which are mentioned in regard to them, we can have little doubt that such was the case.

The term "Leukhemia," or white blood, given to this disease by Virchow, is objectionable, because, in the first place, as is correctly stated by Dr Parkes, the blood is not white, but presents its usual red tinge when drawn from the arm. The colourless clots occasionally observed, will certainly not warrant the application of this term to the blood generally, as they are frequently present without the morbid condition under consideration. Besides, the same name (white blood) has been given with more propriety to the fatty blood, examined by Drs Traill, Christison, and others, which presents a milky, opalescent appearance. What is required to be expressed is, that the blood abounds in colourless corpuscles, and this is, I think, done by the term Leucocythemia—from λευκὸς, white; κυτος, cell; and αἷμα, the blood—literally, white cell blood, which expresses the simple fact, or a pathological state, and involves no theory.

PART I.

THE cases of Leucocythemia hitherto met with may be arranged in four divisions,—1st, Cases which have fallen under my own observaton, or been communicated to me; 2d, Cases which have been published by various authors; 3d, Probable cases, in which, though the blood was not examined microscopically, it still presented such appearances as to warrant a belief that leucocythemia existed; and 4th, A few cases for the purpose of showing that the spleen may be greatly enlarged, without necessarily occasioning the peculiar condition of the blood under consideration.

I.—CASES OF LEUCOCYTHEMIA, WHICH HAVE FALLEN UNDER MY OWN OBSERVATION, OR BEEN COMMUNICATED TO ME.

CASE I.[1]—*Leucocythemia discovered after Death; Hypertrophy of the Spleen, Liver, and Lymphatic Glands.*

John Menteith, aged 28, a slater, admitted into the clinical ward of the Royal Infirmary, February 27, 1845, under the care of Dr Christison. He is of dark complexion, usually healthy and temperate; states that twenty months ago he was affected with great listlessness on exertion, which has continued to this time. In June last he noticed a tumour in the left side of the abdomen, which has gradually increased in size till four months since, when it became stationary. It was never painful till last week, after the application of three blisters to it; since then, several other small tumours have appeared in his neck, axillæ, and groins, at first attended with a sharp pain, which has now, how-

[1] Originally published by the author in the "Edinburgh Medical and Surgical Journal," October 1845.

ever, disappeared from all of them. Before he noticed the tumour, he had frequently vomiting in the morning. The bowels are usually constipated, appetite good, is not subject to indigestion, has had no vomiting since he noticed the tumour; he has used chiefly purgative medicines, especially croton oil; employed friction with a liniment, and had the tumour blistered. On admission, there is a large tumour, extending from the ribs to the groin, and from the spinal column to the umbilicus, lying on the left side. It is painful on pressure near its upper part only. Percussion is dull over the tumour; pulse 90; states that for three months past he has not lost in strength. There is slight œdema of the legs. *To have two pills of iodide of iron morning and evening.*

March 1.—Urine of yesterday somewhat turbid when just passed, natural in colour, acid to litmus; sp. gr. 1013. Sediment presents cubic crystals under the microscope, disappears almost entirely on the addition of aqua potassæ, but is unaffected by nitric acid. The filtered urine is not affected by aqua potassæ, and yields only a slight white haze when boiled.

March 9.—Œdema of legs increased. They have been bandaged with flannel rollers. ℞. *Potassæ Carbonatis*, ʒi.; *Spiritus Ætheris Nitrici*, ʒiv.; *Aquæ Menthæ*, ʒiij.; *Aquæ fontis*, ʒij. M. *Sumat unciam ter in dies.*

March 10.—Tormina and considerable diarrhœa; urine not increased. *Habt. Haustum ex Olei Ricini*, ʒss. *statim; et exactis quatuor horis, Opii*, gr. ii.

March 13.—Attacked this morning with heat of skin; thirst; pulse 110, full, very compressible. The diarrhœa, which had been checked, returned yesterday; none this morning, after taking an opium pill. Urine, 100 ounces. *Omittantur medicamenta. Sumat statim Pulveris Ipecacuanhæ et Opii*, gr. x., *et repetatur dosis singulis semihoris ad tertiam vicem.*

March 14.—No sweating from the powders; diarrhœa still rather troublesome; pulse, 100, softer; tongue, dry and brown; febrile expression of countenance, resembling that of typhus. ℞. *Aquæ Acetatis Ammoniæ*, ʒvi.; *Solutionis Morphiæ*, ʒi.; *Aquæ fontis*, ʒiij.; *Syrupi*, ʒj. *Sumat unciam quartâ quâque horâ. Habt. Decoctum Hordei pro potu.*

March 15.—Died suddenly in the morning.

Sectio Cadaveris.—March 19 (*four days after death*).—Externally, the body presented a considerable prominence of the ensiform cartilage and false ribs on both sides. The abdomen was contracted; considerable dulness on percussion on left side, which had previously been marked out by a line formed with nitrate of silver. No ascites nor œdema of the limbs.

Blood.—The blood throughout the body was much changed. In the right cavities of the heart, pulmonary artery, venæ cavæ, vena azygos, external and

internal iliac veins, and many of the smaller veins leading into them, it was firmly coagulated, and formed a mould of their size and form internally. In the cavities of the heart and venæ cavæ, the blood, when removed, was seen to have separated into a red or inferior, and a yellow or superior, portion. The red portion was of a brick-red colour; it did not present the dark purple smooth and glossy appearance of a healthy coagulum, but was dull and somewhat granular on section, and when squeezed readily broke down into a grumous pulp. The yellow portion was of a light yellow colour, opaque and dull, in no way resembling the gelatinous appearance of a healthy decolorised clot. When squeezed out of the veins, as was sometimes accidentally done where they were divided, it resembled thick creamy pus. In some portions of the veins, the clot was wholly formed of red coagulum. In others it was divided into red and yellow. In a few places the yellow formed only a streak or superficial layer upon the red, or covered the latter with spots of various sizes. Whether this coagulum existed in all the veins could only have been ascertained by a complete dissection of the body. It was seen, however, that the femoral veins, after passing under Poupart's ligament, were empty and perfectly healthy as far down as the Sartorius muscle. The external and internal iliac veins, as well as the pelvic veins, were full and distended. The azygos, both axillary and jugular veins, were full, also the longitudinal, the lateral, and other sinuses at the base of the cranium, and veins ramifying on the surface of the brain. In this last situation some of the veins appeared as if full of pus, whilst others were gorged with a dark coagulum—(see Plate I., which represents the appearances described). In the aorta and external arteries were a few small clots, resembling those found in the veins. These vessels, however, were comparatively empty. The basilar artery at the base of the brain was distended with a yellow clot.

Vessels.—The arteries and veins themselves were perfectly healthy. Although carefully looked for, in no place could thickening or increased vascularity be observed. Nowhere was the clot adherent to the vessels, but, on the contrary, it readily slipt out when an accidental puncture was made in them.

Head.—On removing the dura mater, the veins which empty themselves into the longitudinal sinus were considerably engorged, especially posteriorly. Some were filled with the red and others with the yellow clot previously described. Others, again, were half filled with red and half with yellow coagulum, the passage of the one into the other being clearly perceived. Both hemispheres, with the longitudinal sinus and *falx in situ*, were removed by a section across the brain, as low down as the division of the cranium would permit. The brain was then discovered to be very soft uniformly,—a circumstance accounted for by the time which had elapsed since death. The part

removed was put aside, in order to be preserved and hardened in spirit. The lateral ventricles were found healthy, contained no serum, and the choroid plexus was perfectly normal. At the base of the brain the basilar artery was seen distended with the yellow coagulum, as were also a few of the arteries, but to a very slight extent. The substance of the brain itself was throughout healthy. All the sinuses at the base of the cranium gorged with the red coagulum.

Chest.—A few chronic adhesions united the pleuræ on both sides, which were easily torn through. Both lungs were slightly engorged posteriorly and inferiorly. The anterior margin of the left lung emphysematous, but to no great extent. On section, the yellow coagulum of the blood was observed to occupy all the ramifications of the pulmonary artery. In some places it was so consistent as to be drawn out, exhibiting an arborescent form ; in others, it was more soft, and exuded from the cut surface like thick pus. Heart somewhat enlarged ; weighed, when freed from coagulum, eleven and a half ounces. Its texture was healthy ; the valves normal. The right auricle much distended, and gorged with a firm coagulum, the upper third of which was found composed of the yellow, and the two inferior thirds of the red clot formerly described. The right ventricle and pulmonary artery were similarly distended ; portions of the clot closely embraced the columnæ carneæ, but were in no place adherent. The coronary arteries and veins were normal.

Abdomen.—On the inferior surface of the diaphragm there existed a firm, almost cartilaginous, deposit about a line in thickness, of a white colour, oval form, two inches long by one and a half broad, with irregular margins, which were composed of several rounded tubercular bodies, the size of a small pea, and of a similar structure. The liver enormously enlarged from simple hypertrophy. Its structure throughout healthy. Gall-bladder enlarged, and distended with a clear pale yellow bile. The whole weighed ten pounds twelve ounces. The spleen also enormously enlarged from simple hypertrophy. It was of a spindle shape, largest in the centre, tapering towards the extremities. It weighed seven pounds twelve ounces. It measured in length fourteen inches ; in breadth, at its widest part, seven inches ; and in thickness, four and a half inches. Towards its anterior surface was a yellow firm exudation, about an inch deep, and three inches long. The peritoneum, also covering a portion of its anterior surface, was thickened, opaque, and dense over a space about the size of the hand. Both kidneys healthy. The stomach and intestines healthy throughout. About four inches from the anus the superior hemorrhoidal veins were distended on both sides external to the rectum. They formed two chains of tumours about three inches long, consisting, on the one side, of three swellings as large as a walnut ; on the other, of one swelling somewhat larger. They

were filled with a red coagulum, broken down into a grumous mass. The lymphatic glands were everywhere much enlarged. In the groin they formed a large cluster, some being nearly the size of a small hen's-egg, and several being that of a walnut. The axillary glands were similarly affected. The bronchial glands were not only enlarged, but of a dark purple colour, and in some places black from pigmentary deposit. The mesenteric glands were of a whitish colour, some as large as an almond nut. A cluster of these surrounded and pressed upon the ductus communis choledochus. The lumbar glands were of a greenish-yellow colour, also enlarged, forming a chain on each side, and in front of the abdominal aorta, more especially at its bifurcation into the iliacs.

No collection of pus could be found in any of the tissues.

Microscopic Examination.—The yellow coagulum of the blood was composed of coagulated fibrin in filaments, intermixed with numerous colourless corpuscles, which could be readily squeezed out from it when pressed between glasses. Where the yellow coagulum was unusually soft, the corpuscles were more numerous, and the fibrin was broken down into a diffluent mass, partly molecular and granular, partly composed of the debris of the filaments broken into pieces of various lengths. The corpuscles varied in size from the $\frac{1}{80}$th to the $\frac{1}{120}$th of a mill. in diameter; they were round, their cell-wall granular, and presented all the appearance of pus corpuscles. (Fig. 1.) Water caused

Fig. 1. Fig. 5.

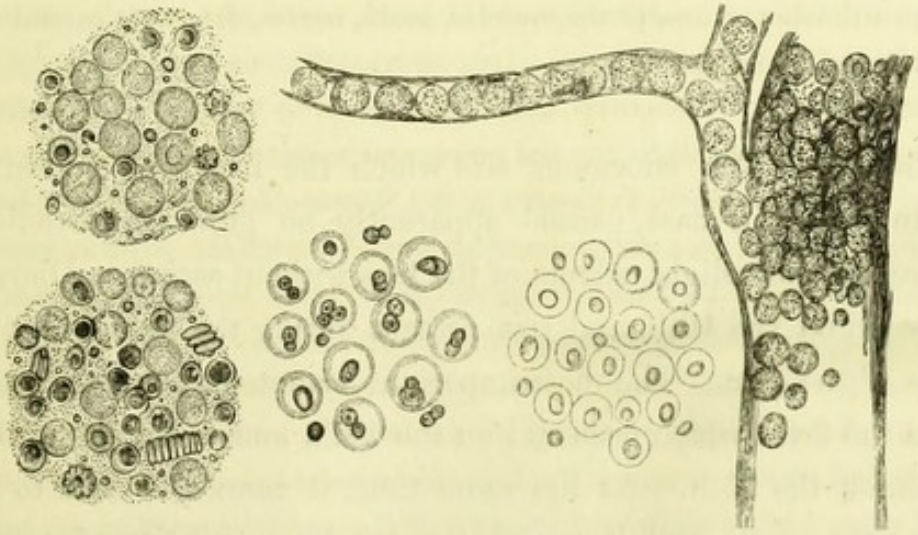

Fig. 2 Fig. 3 Fig. 4.

Fig. 1.—Colourless corpuscles, mingled with a few coloured ones, from the white clot of the blood in Case I.

Fig. 2.—The same bodies, mingled with a larger number of yellow blood corpuscles, in the red clot.

Fig. 3.—Change produced in the colourless corpuscles on the addition of acetic acid, the yellow corpuscles being dissolved.

Fig. 4.—Cells in the fluid squeezed from the lymphatic glands, after the addition of acetic acid.

Fig. 5.—Blood-vessel giving off a capillary from the pia mater; the latter is seen filled with colourless corpuscles; the former partly with colourless, mingled with coloured, corpuscles. 250 diameters.

them to swell and lose their granular appearance, and acetic acid dissolved the cell-wall and caused a distinct nucleus to appear. This nucleus was composed sometimes of one large granule about the $\frac{1}{200}$th of a mill. in diameter, at others of two or three smaller granules, as is seen in corpuscles of laudable purulent matter. (Fig. 3.) The red portion of the coagulum contained a smaller number of these colourless corpuscles, mixed with a multitude of normal yellow corpuscles. (Fig. 2.) The colourless corpuscles now described were found in the blood throughout the system. They were seen in the veins and arteries ramifying on the brain, in the coronary veins, hemorrhoidal tumours, and wherever the blood was examined. On stripping off a portion of the pia mater, and examining the capillary vessels of that membrane, all that were not too minute to contain them were found crowded with the same corpuscles. (Fig. 5.) This fact was confirmed by Dr Allen Thomson, to whom I sent a portion of the brain for that purpose.

The cartilaginous deposit on the inferior surface of the diaphragm was composed of dense fibrous tissue, in which numerous granules and molecules were observed. The exudation in the spleen was composed of amorphous fibrin mixed with numerous molecules, granular and imperfect cells. These were intermingled with bundles of filamentous tissue. The enlarged lumbar glands, on being pressed, exuded a fluid that was crowded with corpuscles; some resembling the colourless corpuscles already alluded to; others oval and round, containing a distinct nucleus. (Fig. 4.)

The ultimate textures of the muscles, brain, nerves, &c., were carefully examined, and found normal.

Remarks.—The enormous size which the liver and spleen had attained in this case, caused apparently no great inconvenience. There was only slight œdema of the legs without ascites. Diarrhœa appeared on the 10th, and was present during the subsequent progress of the case. The most important symptom, however, seemed to be the fever which occurred on the 13th, and continued until his death, on the 15th. At the same time, it cannot be said to have been very severe, and it was unattended by prostration of strength. The post-mortem examination was conducted with the greatest care, for the appearances at the time were quite new to me. Nowhere could the slightest traces of phlebitis be discovered; for, notwithstanding the blood was firmly coagulated in the venous system, so far from being adherent to the vascular walls, on making an open-

ing it slipped out from them with the greatest facility. Neither could abscesses, or purulent infiltration of any tissue, be discovered. No observations having been made on the blood during the life of the individual, it was impossible to say how long that fluid had contained the excess of colourless corpuscles which were found in it after death; but I believed at the time that they were formed towards the close of life, and probably when fever became manifest. A similar conclusion was arrived at by Dr Craigie, from his observation of this case, as well as of the one afterwards to be detailed. (Case IV.) That such conclusion was erroneous, however, will be made evident from several other examples of the disease, but especially from the next to be recorded.

The appearances presented by the blood, as seen in the meningeal vessels of the brain, in the clots from the heart, venæ cavæ ascendens and descendens, &c., are well represented in Plate I.

CASE II.—*Leucocythemia detected during Life; Hypertrophy of the Spleen; Ascites.*

Barney Tinlay, æt. 17, farm-servant, admitted into the clinical ward of the Royal Infirmary, January 25, 1850. With the exception of an attack of scarlet fever, which he experienced about three years ago, he enjoyed perfect health until twelve months since, when he first noticed a swelling in the abdomen, accompanied by some pain. The tumour since this period has gradually increased in size, and latterly he has been unable to walk fast on account of dyspnœa. For the last two or three years he has been employed in farm-service, and during three months last summer he resided in the fenny district of Lincolnshire, but never had intermittent fever. On admission, his complexion is pale, the conjunctivæ are unusually blanched, and his whole appearance is very cachectic. On examining the abdomen, a hard tumour can be felt occupying the whole left side. Superiorly, it can be felt emerging from the false ribs about two inches to the left of the ensiform cartilage. It then passes downwards an inch and a half to the right of the umbilicus, and curves round inferiorly to a point about an inch and a half above the symphysis pubis, from which it may be traced directly backwards to within three inches of the spinous processes of the lumbar vertebræ. Its anterior margin presents a semicircular convexity, which is smooth, with a distinct notch in its upper third, and is apparently about half an inch thick, as with the fingers a fold of integument may be pressed somewhat below

it. The tumour is completely dull on percussion throughout, and is in several parts painful on pressure. It measures about ten inches in the long diameter, and thirteen and a half transversely. The rest of the abdomen has the usual tympanitic percussion, and there is no fluctuation. Liver, on percussion, found to be of the natural size. Tongue clean; appetite good. There is profuse diarrhœa, the bowels being open eight or ten times a-day; this symptom has existed for the last three or four weeks. Pulse 80, weak. Complains of giddiness on assuming the erect posture. Heart-sounds natural. He has occasional epistaxis and hemorrhage from the gums. Respiratory and urinary systems healthy.

The appearance of the blood drawn from the extremity of the finger, when magnified 250 diameters linear, is represented Fig. 6. The coloured corpuscles for the most part have collected together in rolls, the numerous colourless corpuscles filling up the intervening space. Acetic acid dissolved the coloured bodies, and rendered the cell-wall of the colourless ones very transparent—bringing into view the nucleus, consisting of a single round or oval body in some, but in the majority presenting two, three, or even four granules, each having a depression in its centre. Here and there the nucleus was crescentic, or in the form of a horse-shoe. (Fig. 7.)

Fig. 6. Fig. 7. Fig. 8.

Fig. 6.—Appearance of a drop of blood, magnified 250 diameters, taken from Tinlay's finger.
Fig. 7.—The same, after the addition of acetic acid.
Fig. 8.—A drop of blood, treated by acetic acid 24 hours after being taken from the arm by venesection.

January 27th.—He has had eight leeches applied to the epigastrium, and has taken the lead and opium pills—one three times a-day. The diarrhœa is much diminished, and there is less pain. ℞. *Ferri Citratis*, ʒi.; *Tinct. Card. Comp.*, ʒi.; *Infusi Calumbæ*, ℥vii. *M. fiat Mistura cujus Sumat*, ʒi. *ter in die.* ℞. *Sulph. Quinæ*, gr. iij.; *Pulv. Catechu extr.*, gr. iv.; *Ol. Carui.* m. i. *M. fiant pil.*, ij. *Mittantur tales*, xij., *et Sig.*, *Sumant* ij., *Mane et Vespere.*

January 30th.—Diarrhœa now entirely ceased. ℞. *Pulv. Quinæ Sulph.*, gr. iij.; *Ferri Carb. Sacch.*, gr. vij.; *M. fiant pil.*, ij.; *Mittantur tales*, vi.; *quarum Sumat* j., *ter in die. Intermittantur alia.*

Yesterday three ounces of blood were taken from the arm, which Dr Robertson was so good as to analyse. The results are as follows :—

Sp. Grav. of the Blood,			...	1041·5
Sp. Grav. of the Serum,			...	1026·5
Composition of 1000 *parts*—				
Fibrin,	...	...	...	6
Serous Solids,	...	...	...	72
Globules,	...	...	...	67·5
Total Solids,	...	...	...	145·5
Water,	...	...	...	854·5
				1000·0

The analysis was conducted on nearly the same plan as that recommended by Dr Christison, and subsequently adopted by Andral and Gavarret; but it is believed that the fibrin is more exactly estimated than by the process of the latter authorities. The sp. grav. of the blood and serum were very accurately taken, and the errors of manipulation cannot exceed ·5 per 1000 in each constituent.

The blood allowed to remain in a vessel for twenty-four hours presented a large and firm clot. Examined microscopically, it exhibited the same appearance as in Fig. 6—the rolls of coloured bodies not being so large. On adding acetic acid, the same kind of nuclei were observed; but they were now tinted of a deep yellow colour, having apparently imbibed colouring matter dissolved in the serum. Some of the crescentic nuclei had become nearly straight. (Fig. 8.)

February 2d.—Urine is observed to be loaded with lithates, and diarrhœa has returned. *Recipiat Pil. Plumbi opiat.* j. *ter in die, et Syrupi Iodidi Ferri guttas*, xv., *ter in die ex aqua. Illinatur Tinct. Iodini parti dolenti. Intermittantur alia.*

February 26th.—Marked improvement in the expression of his countenance. No increase in size of tumour, which slightly shifts its position when patient changes from one side to the other in bed. Less pains and dyspnœa than formerly. There is still slight diarrhœa, but no epistaxis, and the bleeding from the gums has diminished.

March 24th.—During the last few weeks the hemorrhage from the nose and gums has continued to recur, and the ascites is not abated. He was ordered an astringent lotion for his gums. Since the 11th, Spongio-piline, with Tr. of Digitalis, has been applied to the abdomen, which apparently, in consequence, is less tense, while the pain has undoubtedly diminished.

April 8th.—Diarrhœa again violent. Stools very fluid. He suffers also from

cough, and there is harshness of respiratory murmurs, and prolonged expiration to be heard at the apices of both lungs. No dulness on percussion. *Recipiat Pil. Plumbi opiat.*, j. *ter in die.*

April 13th.—Pain in abdomen, and diarrhœa nearly gone. Sweats profusely at night. ℞. *Quinæ Sulph.*, gr. xij ; *Acidi Sulph. dil.*, ʒj. ; *Syrupi Aurant.*, ℥j. ; *Aquæ font.*, ℥v. *M. ft. Mistura, cujus sumat,* ℥ss. *ter in die. Repetantur Pil. Plumbi opiat.*

April 23d.—The diarrhœa has ceased for the last eight days, but to-day has returned with considerable pain. *Intermittatur Mist. Quinæ Sulph. ; Applicetur Emplastrum Opii* 4 × 4 *Abdomini ; Recipiat Pil. Plumb. opiat.*, ij., *ter in die ; Utatur Enem. Amyli cum Sol. Morph. statim, et Suppositorio Opii quotidie h. Somni.*

May 5th.—Has complained a good deal lately of nausea and vomiting, for which he has been ordered a draught every evening, with naphtha. He has also taken the squill and digitalis pill three times a-day, and had the tumour fomented with infusion of digitalis. Girth of abdomen at this period was thirty-seven inches. ℞. *Sp. Æth. Nitrici,* ℥iss. ; *Aquæ Potassæ ; Sol. Mur. Morph. a. a.*, ʒij. *M. Sig. Sumat,* ʒj. *ex aqua ter in die.*

May 7th.—Distension of abdomen from accumulation of fluid still increases, and pain continues. The urine presents an acid re-action, and is loaded with a copious sediment of lithate of ammonia, with a few colourless rhomboidal crystals of lithic acid. ℞. *Pulv. Scillæ,* ℈j. ; *Pulv. Digitalis,* gr. x. ; *Extr. Hyoscy.*, ʒss. ; *Cons. Rosarum, q. s., ut fiant pilulæ,* xx. ; *Sig. Sumat,* j. *ter in die.*

May 13th.—Since last report diarrhœa has been very profuse, the bowels having been acted upon sometimes twenty times in the course of a night. Stools very loose but feculent. Spongio-piline with digitalis to be discontinued, on account of its pressure causing uneasiness. He has taken the lead and opium pills four times a-day, as well as the starch injection, with Sol. Mur. Morph. at night. *Omittantur pil. Plumbi opiat.* ℞. *Tanini,* gr. xv. ; *Pulv. Opii,* gr. vj. ; *Cons. Rosarum, q. s., ut fiant pil.* vj. ; *quarum Sumat,* j. *sexta q. q. hora.* ℞. *Acidi Nitrici dil.; Syrupi, a. a.*, ʒss.; *Aquæ fontanæ,* ℥j. *M. et Sig. Sumat,* ʒj. *ter in die ex aqua.*

June 1st.—Since last report the diarrhœa has continued, but is now much abated. Fluctuation in abdomen evidently diminished. There has been occasional slight epistaxis. Still sweats at night. Girth of abdomen at broadest part diminished to thirty-five and a half inches. *Intermit. Mist. Quinæ.*

June 12th.—Has progressed favourably to this date ; the tumour and ascites continue to diminish ; and the diarrhœa and other symptoms having abated,

the abdomen is now flaccid, and the skin is cracked similar to what is observed in a woman after pregnancy. To-day the diarrhœa has returned with some violence, with abdominal pain. *Habeant Pil. Tanini ut antea.*

June 26th.—Diarrhœa still more diminished. There is a good deal of cough, with some expectoration, and harsh respiration is heard under clavicles, with increased vocal resonance. Has been taking ʒij. of cod-liver oil three times a-day. His general strength is now greatly improved. He sits up the greater part of the day, and even walks about on the green. His amendment is so great that he is very anxious to return to his parents, who reside in Hull.

August 7th.—Since last report the diarrhœa has returned at intervals, and still continues to be troublesome. On the whole, however, his health has improved ; his appetite and strength have increased, and all ascites nearly disappeared. The cough and expectoration have ceased. The tumour measures transversely thirteen and a half inches, and longitudinally fifteen inches. From the lower border of ribs to inferior margin of tumour, ten inches. The circumference of the abdomen at the widest part (a little above the umbilicus), is thirty-four inches.

He was now dismissed, having for some time expressed great impatience to return to his friends in Hull, and the farther progress of the case has been kindly communicated to me by Dr Sandwith of that town. For some time he was in the Infirmary there, when the same symptoms were observed, more or less severe, that have been previously noticed. Then he lived at his parents' hovel, and finally he went into the Union Work-house, where he died at midnight, July 22, 1851. During all this time the abdominal swelling from the tumour continued, but he had no ascites; the diarrhœa was more or less urgent; the emaciation extreme, and the weakness gradually progressive up to the moment of dissolution.

Sectio Cadaveris, twelve hours after death, was performed by Mr West, surgeon to the Union Work-house. The following report of the appearances observed was communicated to me by Dr Sandwith :—

Extreme attenuation of the entire body.

Nothing unusual in the appearance or structure of the liver, save that the larger hepatic vessels were filled with small patches of coagulated black blood, side by side with immense flakes of a dirty white matter, like imperfectly formed lymph. The gall-bladder was filled with a glairy amber-coloured fluid, not much like bile. The liver weighed three pounds twelve ounces. On cutting into the organ, there oozed out from the smaller vessels a very thin watery blood.

The spleen weighed three pounds fourteen ounces. Its surface was of a sky-blue colour, and dappled with numerous specks like cicatrices, most of them very small, but there were two much larger ones near the summit. It adhered here and there by bands of lymph to the peritoneal lining of the abdomen, and also to the peritoneal covering of the intestines. On the under surface of the organ there was a very small globular lobule, enveloped in organized lymph. A cord, run lengthwise along both surfaces of the spleen, measured twenty-four and a half inches. A cord, similarly applied across the organ, measured eighteen inches. The structure of the spleen was very firm,—indeed very much like that of liver.

The omentum was utterly wasted. The mesenteric glands were most of them somewhat enlarged, pale, and with hard gritty matter in some of them. There were several enlarged glands at the caput coli in a state of congestion. Pale enlarged glands were also seen all along the sigmoid flexure of the colon. The kidneys were unusually shrunken and small, and weighed together six ounces. There was but little difference in the relative weight of each. Their structure was firm. The heart was small, very small, with a few patchy points on its surface. Its cavities contained a whitish imperfectly-formed lymph.

The lungs had so perfectly healthy an appearance that we did not think it necessary to cut into them.

There was no more effusion into either the pleural or peritoneal cavities than is quite natural. There was, however, an effusion, a little in excess, into the bag of the pericardium.

Microscopic Examination.—Next day I received from Dr Sandwith a portion of the spleen, about four inches long, three inches deep, and one inch thick; with a nodule, the size of a large bullet, at the hylus of the organ. In structure, it was found to be simply hypertrophied, the fusiform cells of the trabeculæ presenting their normal character and arrangement, and the cells of the pulp unusually abundant.

I also received portions of the clot taken from the heart, vena cava ascendens, and vena portæ. They presented exactly the same appearance as the clot in Case I., divided into a dead-white, purulent-looking layer, and a tolerably strong healthy-looking red one. The former, on microscopic examination, was almost wholly composed of colourless corpuscles, aggregated together by molecular fibres of fibrin; and the latter, though principally composed of coloured corpuscles, also contained many colourless ones.

Two of the enlarged mesenteric glands which were sent, on section yielded a copious juice, that contained the same cells as are represented Fig. 4.

Remarks.—This boy was in the Infirmary upwards of six months, and the symptoms and entire progress of the case were watched with the greatest care. Unlike the former case, the spleen was the only organ enlarged, the liver presenting its normal dulness on percussion. The abdomen, however, was also the seat of ascitic distension. The smallest drop of blood taken from the boy's finger exhibited, during the whole of his residence in the Infirmary, the excess of colourless corpuscles, and the number of these underwent no perceptible increase or diminution, notwithstanding the varieties of treatment to which he was subjected. Owing to the theories which have been from time to time advanced regarding the functions of the two kinds of corpuscles found in the blood, and of the nature of its colouring matter, iron was the drug which seemed indicated. This boy had also lived in the fenny districts of Lincolnshire; and, although he denied ever having been affected with intermittent fever, it seemed very probable that the enlargement of the spleen was owing to this cause. I commenced the treatment, therefore, with the exhibition of iron and quinine. Other symptoms, however, became so urgent as to demand special attention, and the suspension of these remedies. I allude to the diarrhœa and dyspnœa, the former of which constituted the leading symptom of the disorder during the entire period he remained in the house. All kinds of astringents were given, with occasional temporary, but never with permanent, advantage. At one period he was so exhausted that I expected his death daily for a period of some weeks. He, however, again gained strength; and his bodily powers, except towards the termination of his residence in the house, were subject to considerable variations, evidently dependent on the amount of diarrhœa.

In April, pulmonary symptoms were added to his other complaints; and from the character these presented, as well as from the physical signs, a strong suspicion was formed that he laboured under phthisis pulmonalis. Under a tonic treatment, with cod-liver oil, assisted by the advance of summer, these symptoms diminished, and his general strength was so improved that, as is stated in the report, he insisted on going home. At the time of his discharge he

was remarkably ill, greatly emaciated, and cachectic-looking, with an enormous abdomen,—so that it was only by comparison with what he had been, that he could be said to enjoy tolerable strength. It seems, however, that he reached Hull, by the steam-vessel, in safety, and lived nearly a twelvemonth longer, so that altogether he was under medical observation nearly eighteen months, the morbid condition of the blood existing during the whole of that time. After death the appearance and structure of the coagulated blood exactly resembled that presented in the former case, and there was the same hypertrophy of the spleen, and similar enlargement of the lymphatic glands, but not to so great an extent. The liver, however, was normal, and the lungs apparently healthy, but not cut into.

Dr Robertson was kind enough to analyse the blood for me in this case, and from the results he obtained it appears, that the fibrin was increased to about double its amount in healthy blood. The albumen and salts existed in their normal proportion. The globules were diminished to about one-half their proper amount, which deficiency was counterbalanced by an increase in the amount of water. This combination of increase in the amount of fibrin and diminution in the amount of corpuscles, indicates a condition of the blood which, so far as I am aware, is not peculiar to any other morbid state of the economy. The diminution of the corpuscles, however, seems to be the chief alteration; for in the following case, whilst this was well-marked, the normal amount of fibrin was preserved. The interesting case now to be given entered the wards of Dr Robertson, to whom I am indebted for an account of the symptoms which presented themselves whilst under his care. The account of the post-mortem examination is drawn up partly from my own observation, and partly from the record of the pathologist of the Infirmary, Dr Gairdner :—

CASE III.—*Leucocythemia detected during Life and after Death; Hypertrophy of Spleen, Liver, and Mesenteric Glands; Purpura Hemorrhagica; Bronchitis.*

Janet Mackay, aged 53, for some years past a washerwoman in Edinburgh, was admitted on the 18th July 1850, into the Royal Infirmary, and placed

in ward 13, under the charge of Dr Robertson. She stated, that her health had been uniformly good till the end of March 1850, when she became subject to fits of vomiting, which usually soon succeeded a meal; that about the end of May she observed some swelling of her feet and ankles; that she continued to follow her usual occupation till the 11th of July, when she expectorated a large quantity of blood. The hæmoptysis had since that time frequently recurred, and she had been for some days aware of the existence of bloody spots upon the skin of both trunk and extremities. Her habits had been regular and temperate, and her food (which always included some portion of animal food in the course of each day) seems to have been deficient neither in quantity nor in quality.

State on Admission.—The patient has a sallow and slightly jaundiced complexion; is considerably emaciated; and has lost much of her muscular force. The skin of the body and extremities is marked with spots of *purpura hemorrhagica*, of various sizes,—the largest not exceeding three lines in diameter. The respiration is hurried, but performed without much effort; there is a good deal of cough, and tough bloody sputa are frequently expectorated. The pulse is 120, feeble. The tongue is brown and moist; the gums are spongy, and bleed on pressure. The patient is thirsty, and has little desire for food.

The bowels are habitually constipated, and evacuations are seldom procured without the use of purgatives. The urine is secreted abundantly; its density is 1016; its re-action acid—not coagulable by heat, or on the addition of nitric acid. When this acid is added in successive drops, a deep green colour, rapidly changing to a violet, is produced.

The patient is intelligent, says she suffers little, and is inclined to sleep. No medical treatment has been applied before admission. The purgatives above mentioned were not prescribed by a medical man.

Physical Examination.—Some dulness on percussion and crepitant râle at dependent portions of both sides of the chest. Coarser râles in vicinity of the large bronchial tubes. Heart's sounds normal. Great enlargement of both liver and spleen, indicated by palpation and percussion.

A drop of blood, examined microscopically, was at once seen to contain a most unusual quantity of white corpuscles. This observation was verified by Dr Bennett, and other experienced observers. The corpuscles exactly resembled those seen in the case of Tinlay.

A small quantity of blood—about ℥iij.—taken from the arm, presented the following characters:—a small, easily lacerable coagulum, and a larger propor-

tion of slightly milky serum; no buffy coat. It was analysed by Dr Robertson with the following results :—

Specific gravity of the blood, ...			1036
Ditto ditto serum, ...			1023
1000 Parts contained :—			
Fibrin, ...	2.3		
Serous solids, ...	67·0	Organic, ...	55·8
		Inorganic, ...	11·2
Globules, ...	49·7		
Total solids, ...	119·0		
Water, ...	881·0		
	1000·0		

The abstraction of the blood gave some relief, and the patient soon fell asleep. Symptoms of extreme debility, and recurrence of the hemorrhage from the mouth, were treated by the use of stimulants, of tannin and of turpentine, given in small doses by the mouth, and more liberally in the form of enema. The patient sank, and died on the 22d July.

Sectio Cadaveris.—July 25.—The body was generally emaciated, and there were purpura spots scattered over the whole surface.

The Blood and Blood-Vessels presented nothing unusual to the naked sight. If anything, the blood was unusually fluid in all the large venous trunks, and the clots in the heart were small, soft, and easily broken down under the fingers. I examined the portal system of veins with great care, and found them perfectly healthy, containing only a moderate amount of fluid dark blood.

The Head was not examined.

Thorax.—There were three ounces of clear serum in the sac of the pericardium, and both serous surfaces were covered with ecchymosed spots. The heart was small and pale. The valves healthy. There was a slight atheromatous deposit in the arch of the aorta. The lungs were firmly adherent, especially on the left side ; their substance œdematous, otherwise healthy. Bronchial glands enlarged.

Abdomen.—Liver and spleen adherent. Spots of purpura irregularly scattered over the peritoneum, especially over the linings of the abdominal walls and pelvic viscera. The liver weighed 12 lb. 5 oz. On section, it presented an extremely variegated appearance, being mottled throughout with irregular purplish-brown patches, and resembling an exaggerated form of the nutmeg

liver, except in the greater diffusion and extent of the brown patches. The tissue of the organ was unusually soft. The spleen was much enlarged, and weighed 2 lb. 5 oz. The surface, on section, had a mottled appearance; its general colour being somewhat paler than usual, while here and there small patches of a dull white colour were observed. These corresponded to whitish masses, the largest of which was not double the size of a millet seed. They were irregularly scattered throughout the parenchyma of the organ. The mesenteric glands were much enlarged and very soft,—some of them even fluctuating. On section, they were seen to be mottled with irregular masses of extravasation. All the other lymphatic glands were in a similar condition.

Microscopic Examination.—The blood everywhere contained the same amount of colourless corpuscles, and presented the same appearance as has been already described in Cases I. and II. The cells of the liver varied considerably in size, and many of them contained fatty granules scattered through their interior, or clustered around the nuclei. Others contained a yellow-brownish granular matter, evidently bile. The spleen presented its normal structure, abounding in splenic cells, with a large number of free nuclei. The fluid squeezed from the mesenteric glands contained corpuscles exactly similar to those observed in Case I., and delineated, Fig. 4.

Remarks.—This case, while almost identical with the first in regard to the morbid condition of the blood, spleen, and liver, and the existence of febrile action, differs from it in several remarkable particulars. There was no tendency to diarrhœa. It is expressly stated that she was generally costive. On the other hand, there was an hemorrhagic tendency,—the skin and some serous surfaces being thickly sprinkled with spots of purpura, in addition to hæmoptysis and spongy bleeding gums. In connection with these symptoms, we should remark, that the blood was observed to be unusually fluid after death, and that its analysis by Dr Robertson during life showed that, while the corpuscles were greatly diminished in amount, and the water correspondingly increased, the fibrin had undergone no change in quantity, or, if anything, was slightly under the average. The excess of colourless corpuscles, therefore, is not necessarily connected with an increase in the amount of fibrin, although here, as in Case II., a remarkable diminution in the aggregate quantity of globules, both white and coloured, existed.

CASE IV.—*Leucocythemia detected during Life and after Death; Hypertrophy of the Spleen.*—(Communicated by Dr T. K. Chambers, of London.)

William Gowin, a cabinetmaker, aged 42, had usually resided near Carnaby market, a close-built, but not malarious, part of London. He was never a very strong man, and has occasionally had bleeding from the gums and nose. Towards the end of 1846 he was obliged to give up work, by a cough and pain in the right side. In the early part of 1847 he was a patient under my care at the Chelsea Dispensary, at which time he presented a very pale and cachectic appearance; his gums were spongy, and his skin harsh, and he had a very well-defined tumour in the region of the spleen. On being questioned on this head, he stated it to be of very recent growth, and did not appear to have paid much attention to it. His sputa were occasionally tinged with blood, but I could not discover any stethoscopic signs of pulmonary disease. The tumour grew rapidly; and to provide for his comforts better than could be done at home, and also for facility of observation, he was sent into St George's Hospital, under Dr Nairne, on February 10th, 1847. The tumour then extended two inches over the median line, towards the right side. On the 1st of March he was attacked by violent epistaxis, which was stopped indeed after some difficulty by plugging the nose, but which weakened him so much that he died on the 9th. Immediately on his entrance into the hospital, I examined his blood under the microscope, and found in it a considerable number of large spherical corpuscles, about three or four times the size of the ordinary red globules.

Sectio Cadaveris.—A small quantity, about the size of a bean, of tubercular matter, together with some puckering of the pulmonary tissue, was found at the apex of each lung. The blood was all fluid. The other viscera were healthy, except the spleen, which was greatly enlarged. Its long circumference measured 27½ inches, its broadest circumference 18 inches. Its appearance outside was yellow, mottled, and smooth, and attached to it were some small supplementary spleens, also diseased, one of a singular round form. Its consistence was about that of a raw potato. The section presented a number of spots, as of ecchymosis from the rupture of small vessels. Near the surface, on the posterior part, was a lump of whitish deposit, like those sometimes found in the spleen, in cases of diseased heart.

Remarks.—In addition to the pale cachectic appearance noticed in previous cases, this man had also violent epistaxis, of which it seems he died. Owing to the kindness of Dr Chambers, I have

been enabled to publish a copy of the drawing made from the spleen at the time (Plate 2). Its tissue did not present the appearance of simple hypertrophy, noticed in former cases, but contained a number of irregular fibrinous-looking deposits, apparently the result of previous hemorrhages into the parenchyma of the organ, but the real nature of which is unknown. The blood also was characterised by only a slight increase in the number of colourless corpuscles, but these were comparatively much larger in size, the smallest being, so far as I could judge from a drawing sent to me by Dr Chambers, at least the 1-50th of a millimetre in diameter.

CASE V.—*Leucocythemia detected during Life; Hypertrophy of the Spleen.*—

(Communicated by Dr T. K. Chambers, of London.)

Jane Parsons, a soldier's wife, had usually enjoyed good health till 1845, when, while residing at Windsor, she had what seems from her description to have been mild quotidian ague. She was then 38 years of age. Shortly after this, her attention was attracted by a swelling below the waist on the left side, which, however, gave her no pain or any inconvenience, beyond a slight difficulty in drawing in the breath. About a year afterwards it began to increase rapidly, and in August 1846 she came under the care of Dr Nairne, in St George's Hospital, London. At that period "a large solid tumour occupied the fore part of the left hypochondrium, dipping down to the fore part of the left lumbar and umbilical regions, with no very definite limit towards the right hypochondrium, and not passing at all into the iliac region." It was very hard, and not painful when pressed. The general health was good; the skin clear and fresh coloured, without any of the tint either of jaundice or malignant disease. She left the hospital in a few days, furnished with a belt to support the tumour. She returned on the 13th of March in the following year, saying that she had experienced much comfort from the bandage, but that the tumour had begun again to get larger during the last month. She had also occasional vomiting and constipation, but still the aspect was healthy, and she stated that she was able to continue taking in a little washing from the officers in the regiment. A quinine mixture was ordered to be taken three times a-day, and she returned to the country, with orders to come again in a month. This, however, she did not do. On examining a drop of the blood, it was seen to contain an increased number of colourless cells, as in the last case described.

Remarks.— The facts worthy of observation in connection with this case are, that notwithstanding enlargement of the spleen, and the same slight condition of leucocythemia as was noticed in Case IV., her general appearance was healthy, and there was no epistaxis, diarrhœa, or other of the symptoms which we have previously seen to be the leading features of the disease. There was only slight difficulty on inspiration.

CASE VI.—*Leucocythemia detected during Life; Hypertrophy of the Spleen and Liver.*—(Communicated by Dr R. Quain, of London.)

In the autumn of 1848, M. Boudler came under my notice as a patient at the St George's and St James' Dispensary. She complained of general debility, of swelling and general uneasiness in the abdomen. She said her age was 33, but she appeared older. She was born near Maidstone in Kent, and resided there till she was 22, when she came to London, and acted as a nurse-maid and as a ladies' maid, until she was 26 years of age, when she married. She has never been very strong, though she had no disease of any consequence until she miscarried, about four months after marriage. She then lost much blood by flooding, and her husband soon after having lost his employment as a journeyman tailor, she has not been able since then to procure good food at all times, and she has had much anxiety. From that time she has never been quite well. She never had ague. In early life her menstrual functions were irregularly performed, and she was pale and delicate; but after coming to London she improved in these respects. She has two living children, one aged five or six years, the other nearly four. She has also had two further miscarriages since the birth of her last child. On all these occasions she has lost more or less blood. Her present illness she dates chiefly from the birth of the last child, which she tried to suckle, but which she had to wean at the end of five months, owing to her debility. She then applied for advice to a dispensary, and received some medicine, from which she derived much benefit. She did not menstruate, and soon after observing that her abdomen was swollen, though not as on former occasions, she believed herself pregnant. This impression proved correct, for she shortly after miscarried. The size of the abdomen, however, did not diminish, and it has continued to increase more or less since then,—that is, for rather more than three years. She has during that time grown thin; she is now very emaciated, and her skin is of a sallow hue. She has suffered from dyspepsia, sickness, flatulence, and irregularity of the bowels; she had hæmorrhoids about five years ago, but not since; her appetite is bad; she sleeps badly; her breath is short, but she has

at present no cough ; she has never spat blood ; she has palpitation of the heart on occasions of slight effort or of fright. The menstrual functions are very irregular, and she has leucorrhœa,—this she has always had more or less. Urine scanty, depositing lithates, and staining the bottle which contains it with a deep pink colour ; no albumen. Auscultation and percussion failed to elicit any signs of disease in either the lungs or heart.

The abdomen when examined was about the size of a female's who had advanced to nearly the seventh month of pregnancy. The parietes were tense, and the umbilicus prominent. There was marked dulness at the left side, extending vertically from nearly the level of the fifth rib (on strong percussion) to the crest of the ilium ; and horizontally, from nearly the median line in front to the spine behind. There was also dulness from the same height at the right side to three inches or more below the ribs. At the epigastrium the like dulness existed, but here it passed into a loud tympanitic resonance. The like resonance existed around and below the umbilicus. Owing to this distension of the abdomen with flatulence, it was difficult to define with the hands the edges of either the liver or supposed enlargement of the spleen. But when the patient was placed in the prone position, the existence and general form of these solid bodies were traced, corresponding to the dulness mentioned. The fluctuation of a thin layer of fluid was also observed in the abdomen. There was then no œdema, but she stated that her ankles were often swollen at night.

I prescribed, at the time of her first visit, some mild aperient ; and took occasion to examine her blood microscopically at her next visit. I found the field of the microscope occupied by blood globules arranged as usual, the intervals between these being almost filled up with cells two or three times larger than the blood globules, and containing several granules. They conveyed the impression at first sight of being pus globules, but the contained granules were fewer and less regularly arranged. The patient's pulse on this occasion was marked as being 80, small and jerking. Her tongue pale, not coated nor swollen. I prescribed two grains of quinine, and one grain of sulphate of iron, ten drops of diluted sulphuric acid, and an ounce of mint water, three times daily, and three grains of blue pill, with some henbane, every fourth night, followed by a dose of Gregory's powder. The Samaritan Fund of the Dispensary supplied her with some bread and milk and warm clothing. Under this treatment, slightly modified, she continued for nearly three months, and her general health was considerably improved. The size of the abdomen was but little altered. She then expressed an intention of going into the country, and I heard no more of her. I examined the blood on two other occasions, without seeing any material change in its appearance. The existence of nuclei in the large cells was rendered evident by the action of acetic acid when used once.

CASE VII.—*Leucocythemia detected during Life; Hypertrophy of the Liver, and probably of the Spleen.*—(Communicated by Dr R. Quain, of London.)

(Of this case I have no notes, having seen the patient only once.)

A commercial traveller, between 40 and 45 years of age, of rather stout conformation, called on me in January 1849. He said he was about to leave town the same evening, and he was anxious to get some advice before doing so. For more than six months he had felt less equal to his work than previously; he knew of no cause for this, as he generally enjoyed good health. The last four months he felt this feeling increasing, and he complained more particularly of shortness of breathing, and being easily fatigued. He suffered much from indigestion and from hæmorrhoids. He said that he had become stouter round the waist. On examining the abdomen, I found considerable enlargement of the liver, and the dulness continuous with it extended from the epigastrium into the left hypochondrium. I recollect, however, that I had some doubt as to this being connected with enlarged spleen. The microscope happened to be on the table, and more as a matter of curiosity than anything else, I placed a drop of blood from his finger under it, and was somewhat surprised to find a very great number of the large granular cells mixed with the blood globules. They were, I think, fewer than in the other case. I prescribed some bitter tonics and mild aperients, with a little blue pill. I have not since seen this patient.

Remarks.—The hemorrhagic tendency was manifested in Case VI., after every confinement, by flooding. Epistaxis, dyspnœa, and diarrhœa are not mentioned as having been present. In Case VII. there was slight difficulty of breathing. In both there were hemorrhoids.

The two following cases, for which I am indebted to Professor Walshe, having been made the subject of clinical investigation with a class of students, were reported with extreme care, and are therefore of great value. From the copy sent to me, taken verbatim from the case-book, I have condensed what has appeared to me important in reference to the subject of leucocythemia.

CASE VIII.—*Leucocythemia detected during Life and after Death; Hypertrophy of the Spleen and Liver.*—(Condensed from Dr Walshe's Case-book.)

Caroline Smith, æt. 28, admitted into the North London Hospital under the care of Dr Walshe, August 10, 1846. She had formerly been under the care of Dr Taylor, and was dismissed only seven weeks ago. Since then she has been labouring under cough, œdema of the inferior extremities, and diminished secretion of urine. She has also had bleeding from the gums to a considerable extent; and latterly there has been vomiting. Four months previous to her first admission she had intermittent fever, occurring daily; but this point was not sufficiently inquired into. On admission, the circumference of the abdomen at two inches above the umbilicus is thirty-six inches and three-quarters; its general surface is globular, even, and uniform, except one inch below and two inches and a half to the left of the umbilicus. This point corresponds with a hard and prominent part of the solid mass within the abdomen. The superficial veins are not distended. Over the surface of the abdomen (especially towards the hypogastrium) there are various irregular fissures, and slight lines of extravasation in the skin, from distrusion. The lateral left surface of the tumour, though in the main smooth and even, conveys the sensation of a rough, corrugated, finely splenic surface; no nodules or large tuberculation of surface; its lower border is four inches and a half above the pubes, and has evidently no connection with the pelvic bones; it passes up distinctly beneath the ribs. The upper margin of the dulness over it extends to a level with a line carried round from the point of the ensiform cartilage.

In front of the abdomen there is a distinct sense of peripheric fluctuation, which is lost when percussion is made over the tumour; no common fluctuation. There is fulness in the right hypochondrium; she feels easiest in the sitting posture, being thus less distressed by cough or dyspnœa. No great pain is felt anywhere; none in the tumour. The apex of the heart beats within three inches and a half of the clavicle and a quarter of an inch from the sternum. The mouth presents patches of apthous exudation. The three following days there was considerable dyspnœa. No dulness on percussing the lungs posteriorly; but in the left supra-scapular fossa bronchophony was marked, inspiration harsh and exaggerated, with loud expiration. At the base, inspiration blowing, without corresponding expiration. On the right side the sounds are less marked. On the 14th the bowels were opened five times, and diarrhœa continued more or less severe until her death. On the 15th there was a return of the bleeding from the gums, which only continued

a few hours. On the 22d the stools were streaked with blood. On the 24th œdema of leg and anasarca was observed to be extending. An erythematous blush on left leg. On the 26th expectoration thick and puriform. Pulse 128, feeble. Respiration under left clavicle bronchial. On the 28th respiration fifty-two in the minute, gasping; urine, eighteen ounces. 31st,—Emaciation much increased. Passes urine in bed. Slight delirium. Measurement of abdomen at umbilicus, forty-eight inches and a five-sixth. Died September 1.

Sectio Cadaveris, six hours after death.—The Blood in the veins is fluid, grumous, of a dirty brown colour. When the descending cava is cut, it flows out in large quantity, resembling in its appearance the grumous substance which issues from excessively softened spleens. Examined microscopically, it is seen to contain colourless corpuscles as numerous as the coloured ones. From the description given, they were evidently similar to those noticed in former cases. Although it is not stated in the report, these corpuscles were seen during the life of the patient, in blood drawn from the finger, and were frequently demonstrated to the class.

Chest.—The right cavities of the heart were distended with blood, presenting the characters above described. Pleuræ on right side universally adherent, but on the left side they are only adherent slightly at the posterior surface. Lower portion of left lung is not crepitant, of dirty grayish-brown colour, and sinks in water. Apex also somewhat condensed, and loaded with pigment. The right lung generally crepitant, with a cretaceous concretion, size of a pin's head, surrounded by a stellate puckering.

Abdomen.—The spleen entirely filled the left hypochondrium to the extent ascertained during life. On removal, it weighed three pounds and a half. It is eleven inches and three-quarters long, six inches broad, and two inches and three-quarters thick. Externally it presents the corrugated, wrinkled surface of a cirrhosed liver. On section, a large quantity of the blood formerly described exudes from it. It is generally dense and heavy, but more resistant in some places than in others. The cut surface is of a brick-red tint, slightly granular, minutely spotted with blood. The veins are dilated, but healthy in texture. The capsule is easily separable, and is thickened here and there by old exudation. The liver is much enlarged, its anterior border, by pressure, dividing the stomach into two portions, as is seen in cases of hour-glass contraction. When removed, it weighs thirteen pounds and three-quarters; measures, transversely from right to left, thirteen inches and a half; from above downwards, twelve inches and a half; and from before backwards, three inches and a half. Its surface is in general smooth and natural; free

from adhesions. On section, the centres of the lobules are injected; but there is no cirrhosis. Its substance is very friable; and, from the large veins, great quantities of the grumous blood pours out on section. The kidneys of dark colour, congested. Other organs healthy.

Remarks.—In this valuable case there were present all the leading symptoms we have previously seen to exist in former well-marked instances of the disease: bleeding from the gums, dyspnœa, and continued diarrhœa. The enormous size of the liver, weighing thirteen pounds and three-quarters, is also worthy of observation. Nothing is said with regard to the lymphatic glands. The antecedent occurrence of intermittent fever is alluded to, although this was not positively ascertained.

CASE IX.—*Leucocythemia detected during Life; Hypertrophy of the Spleen.* —(Condensed from Dr Walshe's Case-book.)

Pierre Dujardin, æt. 38, admitted into the North London Hospital, June 24, 1850. Formerly a French artilleryman, but for the last three years a clerk. Has never had ague, or lived in an aguish district. Six weeks ago, when suffering from indigestion, he first perceived that the left side was hard, while the right side was soft. On admission, the abdomen is observed to be enlarged on the left side, as he lies on his back. On percussion, dulness commences on a level with the seventh intercostal space, and continues downwards laterally to the crest of the ilium. From thence the line of dulness turns round anteriorly, in the form of an arch. At its lowest point it is three fingers' breadth above the pubes, and ascends from thence in the middle line, joining the hepatic dulness at a right angle. Within these limits there is felt a solid substance, with a uniformly smooth surface. The right edge is rounded, and so well defined as to be almost capable of being seized by the hand. On placing the patient on his right side, the posterior edge of the tumour is found to extend back to within a hand's-breadth of the spinal column. The left half of the abdomen, two inches above the umbilicus, measures seventeen inches; the right half, sixteen inches and three-eighths. Apex of the heart beats in the fourth intercostal space. Aortic impulse increased, but without abnormal murmur. Respiration of left lung impeded, and murmurs diminished, over inferior portion of chest on left side. Has no œdema of extremities. *Frictions with the Ung. Plumbi Iodidi, ℥j., over the tumour twice a-day.* ℞. *Potass. Iodidi,*

gr. iii.; Inf. Cascarill. ℥ss.; *Aquæ,* ℥j. *M. Ft. Haustus. To be taken twice daily.*

June 29.—The urine passed is ℥xvj., density 1026, containing a deposit of uric acid plates. Never suffered from urinary symptoms. The blood contains an increased number of colourless corpuscles, certainly five times as many as are seen in health. *July* 4.—The tumour is now two inches and a half to the right of the median line, and its lower edge two inches and a half below the umbilicus, having ascended since admission. *July* 20.—The lower border of tumour is drawn inwards. The abdominal swelling is increased laterally. Two inches above the umbilicus, the abdomen measures, on the left side, seventeen inches and a half; and on the right side, seventeen inches and a three-eighth. *August* 2.—Discharged, his general health being tolerably good.—*Since the 23d of July, the Potass. Iodid. has been discontinued; and he has taken three grains of Quinine three times a-day.*

Remarks.—This man's general health seems to have been tolerably good during his residence in the hospital, and none of the symptoms so prominent in the last case were present.

CASE X.—*Leucocythemia detected during Life and after Death; Bright's Disease: Hypertrophy of the Spleen and Liver.*—(Communicated by T. P. Heslop, M.D., Resident Medical Officer at the General Hospital, Birmingham.)

John Duffy, ætat 42, spare, red hair; about 5 feet 7 inches in height; 10 stone and a-half in weight; married; a farmer's labourer; born in Ireland. Admitted into the hospital, under the care of Dr Johnstone, on the 24th of March 1851. Eight months ago, July 1st, 1850, this man first applied for relief at the hospital. He then complained of uneasiness and swelling in his left side; and his general appearance at that period did not materially differ from his present condition. The account he gave was,—that two years previously, during the summer, he first noticed a swelling in the left side, and that his urine became very thick. Nine years ago, he had been engaged regularly at harvest work in Lincolnshire, where ague was common. The following year, in March, he was attacked with ague, and regularly shivered every third day, the paroxysm usually occurring in the evening. He was ill for a fortnight with the attack, which was the last time he suffered from the disease, though, for the five preceding years, in which he had gone to the same district, he uniformly had an attack of ague a few months after his return. He observes, that since the last attack, the colour never fully returned to his cheeks, but he

was able to do his work nearly up to the time of his admission, though latterly with great difficulty, from weakness and shortness of breath. The whole left hypochondrium was dull on percussion, and a considerable portion of the left half of the abdomen was equally so, being occupied by a firm resistant substance, which passed superiorly and posteriorly behind the left lower ribs into the gastro-splenic region, while it displaced the intestines to the right side, and inferiorly. His blood was examined microscopically, and found to contain great number of pale cells, with granular contents, averaging about twice the size of the yellow corpuscles, though some of them were of larger measurement. I was struck with the great size of the *nucleus* of some of these bodies, appearing, in fact, nearly as large as the yellow corpuscles, and adherent, I thought, *uniformly* to the cell-wall; those corpuscles which contained minute ill-aggregated granules, for the most part contained no very obvious nucleus, while those which had a perfectly distinct adherent nucleus appeared to me absolutely free from other contents. After remaining in the hospital for a few weeks, he was discharged, but after a short time was re-admitted, when his urine was noticed to be albuminous.

He has been almost constantly either an in or out-patient of the hospital since July of last year. On his appearing to-day (March 24), he was so evidently getting worse, that he was again admitted. His face is pale and worn; skin dry and wrinkled; ankles œdematous. Complains of a singing and noise in the head, unattended by severe pain. Sight unimpaired; but he is so deaf that he is scarcely able to hear the loudest talking. He states that the deafness has only come on during the last fortnight.

The abdomen is more prominent than ever; the hypogastrium giving the appearance of the bladder when in the last degree of distension; the superficial epigastric veins slightly more evident than natural. No distension of mammary veins. A tumour, with well-marked outline, is felt occupying the whole abdominal regions, with the exception of the right hypochondrium, umbilical and iliac regions. When the patient stands, the tumour seems to rest upon the pubes. To the touch it is uniformly firm and resistant, its inner border, near the umbilicus, being distinctly and deeply fissured. No friction or fluctuation observable. It does not extend further back than the anterior superior spine of the ilium. The whole of the abdomen, exclusive of the regions already mentioned, is absolutely dull on percussion, the smartest stroke not eliminating even the gastric tympany, excepting immediately below the limit of the præcordial clearness. The superior limit of the dulness is about three inches below the angle of the scapula. Heart sounds normal. No murmurs in the neck. He is quite free from epistaxis or diarrhœa. The urine is turbid, depositing on standing a large quantity of lithate of ammonia; acid; spec. gravity,

1020; moderately albuminous. The microscope reveals nothing but a few epithelium scales and amorphous lithates. The blood has a slate-brown tint on its surface, as when about to show the buffy coat. Large, pale, granular cells in great profusion are still observed in it. Ordered a saline purgative three times a-day. On the 31st diarrhœa came on, for which he was ordered an opiate. On the 3d of April he complained greatly of the noise in his head, for which he was blistered. Continuing to get worse, he insisted upon leaving the hospital on the 10th of April, and died seven days afterwards.

Information of his death having arrived at the hospital on the 19th of April, I went, accompanied by my friends, Mr Elin, the house-surgeon, and Mr Sharman, to his residence, and requested an examination, which was readily granted. The attendant, an intelligent woman, informed us, that two or three days before death Duffy had complained of severe pain about the right hypochondrium, and had frequently mentioned, with surprise, the great diminution of his belly, having made her feel the left side to convince her of the fact. On examining the body externally, about forty hours after death, the weather being rather warm, I was greatly struck with the *softness* of the whole abdomen; in fact, on the front surface I could not define, either by palpation or percussion, a distinct tumour, so that I could not avoid expressing a suspicion that the spleen had ruptured, discharging its contents into the peritoneal cavity.

Sectio Cadaveris, April 19.—The feet and ankles œdematous. On an incision being made through the parietes, the intestines alone came into view, with the exception of a small portion of the edge of the spleen, on the extreme left of the cavity. No fluid effusion or adhesions were noticed. On thrusting the hand into the posterior part of the left lumbar region, the spleen, enormously enlarged, was brought into view. It was easily dislodged from its situation, having contracted no adhesions to the surrounding organs. Its vertical measurement was 16½ inches; the transverse, above, 7¾ inches; below, 9½ inches. Its depth, 2¾ inches; and circumference, 37¼. It weighed 7 lb. and 13 ounces. On the spleen being taken out of the cavity, and the intestines being displaced, the liver was observed to be hypertrophied to nearly three times its natural size. Its structure was so perfectly broken down as to be nearly diffluent, so that it was found impossible to carry it away. In spite of its immense enlargement, it was entirely concealed by the ribs and upper portion of the intestines. The kidneys were enlarged, very soft, and of an uniform reddish colour; it being difficult to see the line of separation of the lobular and cortical portions. The right kidney (the only one weighed) was 6 oz. in weight. The heart dilated, its walls friable, and of a dark red hue. The ventricles moderately dis-

tended with imperfectly coagulated blood, of the colour of dark clay, and which, but for its situation, would have scarcely been imagined to be blood. The aortic valves were slightly atheromatous at their margin. The other organs were not examined.

Upon making a section subsequently of the spleen, no other change was noticed in its structure than that of being of a somewhat lighter tinge than natural. I observed, on a microscopic examination, a large number of cells, which differed in no respect from those seen in the blood during life.

Remarks.—In this case there had been repeated attacks of intermittent fever, the last of which occurred nine years before he came under observation, and seven years before the abdominal tumour was perceived. He had no diarrhœa or epistaxis at first, but laboured under Bright's disease and œdema of the inferior extremities. Latterly, however, diarrhœa was present. The colourless coagula of the blood are stated by Dr Heslop to resemble dark clay, and were doubtless similar in appearance to what has been noticed in other cases. The state of the lymphatic glands is not noticed.

CASE XI.—*Leucocythemia detected after Death; Hypertrophy of Liver and Spleen.*—(Extracted from the Pathological Record of the Royal Infirmary, Edinburgh.)

Ann Stenhouse, æt. 37, admitted into the Royal Infirmary, under Dr Douglas, August 20, 1846. Six months ago she had a child; two days before delivery there was a severe flooding. She has suckled the child until a month ago; but has gradually become weaker. About three months ago, she first noticed a tumour in left side of the abdomen. It has caused no pain, but there has been great difficulty of respiration. During the last five days there have been acute pains in the left hip, and on the inside of both legs and thighs. On admission, she is greatly emaciated. The abdomen is relaxed; tender on pressure. In the left hypochondriac region a tumour can be felt, extending from the lower margin of the ribs to a level with the umbilicus; its anterior margin being four inches from the median line. There is no appetite; great thirst; bowels constipated; tongue red; pulse 108, small. The inferior extremities swollen and œdematous. On the 22d, she became comatose, and died at 6 P.M.

Sectio Cadaveris.—Chest.—Both pleuræ adherent throughout the whole of their extent by chronic lymph. Lungs somewhat congested, but otherwise

healthy. Pericardium contained about one ounce of sanguinolent serum. Right cavities of the heart distended with grumous semi-coagulated blood. Valves healthy.

Abdomen.—Surfaces of liver and spleen extensively adherent by chronic lymph to the surrounding viscera. Liver much hypertrophied, weighing six pounds four ounces; its structure normal. Spleen also enlarged, weighing two pounds four ounces; its surface divided into fine lobules. On section, it was dense and resistant to the knife; but its structure was normal. The solitary and aggregate glands of the intestine somewhat enlarged; the other viscera healthy.

The Blood of the mammary artery and veins was apparently mixed with pus. In the heart and venous system generally, its fluid portions were of a port-wine colour, and the grumous masses closely resembled the matter squeezed from a softened spleen.

Microscopic Examination.—The softened clots were everywhere composed of numerous molecules and granules, fragments of molecular fibres, colourless and coloured corpuscles. The yellow existed to the white corpuscle in the proportion of one to two; the latter were generally $\frac{1}{100}$th of a millimetre in diameter, although some were twice that size. In structure they were identical with those previously described.

Remarks.—This case was in the Infirmary only two days, and, from the facts stated, it would appear that there had been flooding previous to the delivery of her last child, œdema of the inferior extremities, owing to the enlarged size of the spleen, and feverish symptoms before death. The examination was made by Dr Redfern, during my absence on the Continent in the autumn of 1846, and the appearances observed, together with the microscopic examination of the blood, render this a most decided example of the disease. The colourless were twice as numerous as the coloured corpuscles.

CASE XII.—*Leucocythemia detected after Death; Hypertrophy of Spleen, Liver, and Lymphatic Glands.*—(Communicated by Dr W. T. Gairdner.)

T. L., an Irish labourer, æt. about 60, was admitted into the Royal Infirmary on the 22d May 1851, complaining of exhaustion and suffering, arising from ulceration of the gums, which altogether prevented mastication, and greatly disturbed his articulation. The teeth were almost all decayed, and many of them extremely loose; the gums in the lower jaw almost destroyed

by ulceration of the mucous membrane, which had a phagedenic character, and extended at some points to the inner surface of the lips; slight cough; no ulceration of throat; no trace of scorbutic affection in the limbs; a very few small petechiæ on the shoulders and neck, which were considered flea bites. He was of exceedingly dull intellect, and could not be brought to give an accurate history of himself; but his replies rendered it probable that he might have taken mercury before admission, at the same time, that no certain information could be gained either as to this fact, or the origin, nature, and duration of the disease, for which he had previously been treated.

During his illness, attention was chiefly directed to the local affection, and to the extreme state of exhaustion, which required from the first the administration of stimulants. He had little appetite, and seemed to labour under an obscure remittent fever of typhoid type, but without marked nervous or other local symptoms. He complained occasionally of pain in the abdomen, but not distinctly localised,—the bowels were rather confined,—the stools natural,—the tongue natural,—the urine sufficiently abundant, but not particularly examined. Quinine, sulphuric acid, stimulants, and regulated diet had little effect; he died, rather sooner than was anticipated, and without change in symptoms, on the 8th June.

Sectio Cadaveris, June 12th 1851.—Body somewhat emaciated,—presents some marks of commencing decomposition. The external lymphatic glands present considerable enlargement, especially on right side of body. The parotid and submaxillary glands of right side are distinctly enlarged, Those of the opposite side almost normal.

Chest.—The surfaces of the left pleura are slightly adherent at the apex of the lung, the diaphragm is free anteriorly, but at the lower and back part, the lung is firmly and extensively adherent, and cannot be removed without injury to the tissue of the organ. Similar adhesions exist in the opposite lung, but they are less extensive. Both costal pleuræ present a slightly mottled appearance, from the existence of scattered petechiæ, and both contain from two to three ounces of sero-sanguinolent fluid. On the left side, there exists, partly by the adhesions at the base of the lung, a transverse septum extending from the convex surface of the diaphragm to the opposite sixth and seventh ribs, and completely separating the pleura into two cavities, the lower capable of containing a pint of fluid, and in relation with the convex surface of the spleen. The pericardium contains about half-an-ounce of sero-sanguineous fluid. The heart is of normal size. Weight, 10½ ounces. The valves, ventricles, and lining membranes perfectly normal. The tissue of the heart is soft and pale. The right cavities of heart contain little blood. In the right side, there are several

soft colourless coagula. The bronchi contain little fluid, and their mucous membrane is normal. The bronchial glands are in general of small size and dense. Several of them on section, present an appearance of dark pigmentary deposit. In the centre of one there is a mass of atheromatous matter. The right lung is universally crepitant, slightly impaired at posterior part of lower lobe, which is augmented in density. At the apex there is a small, but tolerably well-marked cicatrix. The left lung is normal, with the exception of slight impairment of crepitation at the lower and posterior part.

Abdomen.—Immediately under the peritoneum there are several extravasations of blood, especially in the neighbourhood of the spleen, where a patch existed five inches square. The alimentary canal (with the exception of the stomach), presents few abnormal appearances. The solitary and Peyer's glands are well marked but not injected, and several of them present a few petechial points. The mesenteric glands are generally enlarged, but none of them exceed greatly the size of a French bean. The liver is large, pale in colour, and free of abnormal appearance, with the exception of some petechiæ on the serous surface of lesser lobe. Weight, 80 ounces. The spleen, which, in consequence of firm adhesion to the diaphragm, was detained high in the abdomen, was much enlarged, weighing 34 ounces. On section, some portions were found of the normal colour and consistence, while others were deeper purple than natural; and abruptly divided from these, there were many parts of soft friable consistence and a lighter colour, mingled distinctly with an opaque yellowish tint. These portions, on microscopic examination, were found to abound very much in the corpuscles proper to the spleen, being as usual of very various size and appearance; but mingled with them were many more or less resembling the white corpuscles of the blood. The Malpighian vesicles were nowhere visible, and the trabeculæ not more than usually distinct. The lymphatic glands of the posterior cervical, axillary, submaxillary, and inguinal regions, present more or less enlargement, nowhere very considerable. The largest are about the size of a hazel-nut. On section they are rather friable, abounding in whitish juice, and present abnormal vascularity at some points, but no distinct deposit. On microscopic examination, the white juice abounds in corpuscles, many of them nucleated, often reaching $\frac{1}{100}$th or $\frac{1}{120}$th of a millimetre in diameter, but of no characteristic type. The mesenteric glands present a similar condition, but none of them exceed the size of a wild cherry. The microscopic appearances are similar.

Blood.—The blood had, in all the vessels examined, and in the heart, a less deep-red colour than usual, and also a more muddy or greyish tint than natural, very similar to that observed in the mixture of pus with the blood. On microscopic examination, its white corpuscles were found in very large

quantity, amounting in the fluid parts of the blood to nearly two-thirds the number of the red. Neither the red nor the white presented any altered characters. The nuclei of the latter were perhaps rather more apparent than usual; and their diameter was mostly double that of the red, which were on an average, rather smaller than is commonly observed.

Remarks.—This man presented febrile symptoms; but had no diarrhœa or hemorrhagic tendency, unless the sponginess of the gums, and the petechiæ in the mucous membrane and abdominal walls, be considered evidences of it. A careful examination of the structure of the spleen by Dr Sanderson proved it to consist of simple hypertrophy, principally dependent on an excess of its cell elements. The lymphatic glands were generally enlarged, and yielded a juice abounding in the same cell elements as have been found in them on previous occasions.

CASE XIII.—*Leucocythemia detected after death; Enlargement of the Spleen and Liver; Hemorrhagic Apoplexy.*—(Communicated by Dr James Wallace, of Greenock.)

David Hosie, mason, æt. 17, admitted 9th March 1850. Six months ago, in consequence, as he supposes, of having strained himself a week previously when lifting a heavy weight, the patient became affected with acute pain in the left hypochondrium, which was so severe as to prevent him from resting on the right side. At the same time, also, a hard swelling began to appear below the false ribs of the left side. It was painful on pressure, and increased rapidly in size, but has for the last five months remained stationary. The pain was relieved by cupping, and the patient continued afterwards without any particular uneasiness till six weeks ago, when he became affected with looseness of bowels, the stools consisting of blood and slime, and being accompanied with tormina and tenesmus. These symptoms continued for fourteen days, and reappeared after an interval of a week,—the dejecta, however, being free from blood.

On examination there is observed great fulness in the left side of the abdomen, caused by the presence of a tumour which extends from the hypochondrium to more than midway between the umbilicus and Poupart's ligament, its anterior margin being well defined, and about half an inch to the left of, and parallel with, the linea alba. It can be moved slightly upwards and downwards, and forwards and backwards, has an even surface, and is without

pain even on pressure. Slight fluctuation is felt in the lower part of the abdomen, and there is some pain in the epigastric region when pressure is applied. Stools frequent and loose, but quite feculent; tongue clean and moist; appetite impaired; skin of a natural heat; pulse 84, soft; diathesis strumous.—℞. *Hydriod. Potass.*, ℈ij; *Tinct. Iodin.*, ʒij. *M. Ft. liniment. tumor. sæpe applicetur.*

11th.—℞. *Bromid. Potass., gr. xlviij.; Syrup.*, ʒj.; *Aq.* ʒv. *M. Sum.* ʒss. *ter die. Contin. frictio.*

15th. The patient continued as last reported till this morning at nine o'clock, when he was found hemiplegic on the right side, and unable to articulate, but without any impairment of the power of deglutition. His pupils were natural, but contracted sluggishly on exposure to light. He appeared conscious when roused, and cried when spoken to. He pushed out his tongue when desired, and it was observed to be turned towards the right side.

About half an hour before the above changes were noticed, the patient was sitting up and took his breakfast heartily; the paralytic seizure having come on without any premonition, so that he was affected for some time before the nurse, or any of the surrounding patients, perceived anything unusual.

He continued in the above state till noon, when he expired, after having had two convulsions.

Sectio Cadaveris.—March 17th.—The upper half of the left hemisphere of the brain was completely disorganised, and occupied by a large mass of blood, imperfectly coagulated and mixed round the edges with pieces of softened cerebral substance. The rest of the brain, as well as the membranes, appeared healthy, and no change in the vessels supplying the organ could be observed.

The thoracic viscera were healthy.

The abdominal cavity contained about 20 oz. of serum. The spleen was enormously enlarged, and found to occupy a space corresponding to the lines indicated in the first report, its weight being 5 lb. 10 oz. avoirdupois. The liver was likewise enlarged, and weighed 6 lb. 9 oz. Both kidneys were natural.

The blood throughout the body was apparently not coagulated. As the sternum was being disarticulated, the right *vena innominata* happened to be punctured, and the blood which escaped appeared to have a mixture of a cream-coloured fluid, which was now floating on the top of it. This led to a farther investigation, and it was found, on opening the principal veins, that the blood communicated a greasy sensation to the fingers, that it had a dirty purple colour, and contained the above-mentioned ingredient, which was evidently most abundant in the splenic vein. Some of the blood effused into the brain

was collected and set aside, as also some from the *vena cava* inferior. In both specimens, after repose, the creamy fluid separated from the blood corpuscles, between which and the serum it lay floating. In the specimen from the *vena cava* the creamy deposit was twice the bulk of that of the blood corpuscles, but the reverse was the case in the other. On subjecting a drop of the fluid to the microscope it was found to consist of well-formed pus globules, a preponderance of which, over the coloured corpuscles, was presented by a drop of blood from the spleen itself.

Remarks by Dr Wallace.—In this case there existed hypertrophy of the spleen and liver, complicated with diarrhœa, and terminating in hæmorrhagic apoplexy. In the last respect it differs from all the cases hitherto recorded, but manifests, at the same time, the tendency to sanguineous effusion, which appears in such cases to be not uncommon. It will be observed that no notice is taken of the state of the lymphatic glands, either during life or after death, although it is mentioned that the patient was of a strumous habit. But this apparent omission is easily explained, for in drawing up my reports I made it, for the sake of brevity, an almost invariable rule to record few of the appearances which might be regarded as natural. Independently of that, however, my recollection of the circumstances of the case is so vivid that I can with confidence assert, that the glands were not enlarged, and, besides, that the boy had never been out of Glasgow, and at no time had any fever of the intermittent class. The *post mortem* examination was conducted in the presence of Dr J. A. Easton and Professor Wm. Thomson, the latter of whom thought it probable that the blood would exhibit an appearance similar to that witnessed in Dr Craigie's case, at the inspection of which, if I mistake not, he had been present. I accordingly subjected it to a microscopical examination, and found the conjecture to be correct, the blood being actually loaded with what I regarded as pus corpuscles,—an observation confirmed by Professor Allen Thomson and his demonstrator, Dr Aitken, to whom a specimen had been sent for that purpose.

CASE XIV.—*Leucocythemia detected after death*; *Hypertrophy of Spleen: Cirrhosis of Liver; Bright's Disease.* (Communicated by Mr Drummond.)

The patient was a man of exceedingly intemperate habits, and aged about 45 years, who died in the Infirmary, under the care of Dr Andrew, 20th July 1851. He first entered the Infirmary, 22d December 1850, with Bright's disease, and considerable œdema of the feet and legs, soon followed by general anasarca. He was so far relieved, however, by treatment, that he was dismissed 7th April 1851. He was again admitted 11th June, having been almost always intoxicated during the interval. The anasarca was now very general, and the urine for some time extremely albuminous, containing enormous quantities of epithelial elements and disintegrating tube casts. He died comatose, but never suffered from diarrhœa, or any form of hemorrhagic extravasation.

Sectio Cadaveris.—The liver weighed about 3 lbs., and presented the appearance of a considerably advanced stage of cirrhosis.

The kidneys were slightly enlarged, very pale, and the cortical substance occupied throughout with obscure granulations of Bright.

The parts to which I wish chiefly to refer are the spleen and the blood. The lymphatic glands were nowhere enlarged, and the other blood glands appeared quite healthy.

Spleen.—The spleen was greatly enlarged, weighing 2 lbs. 2 oz., and very soft, almost diffluent. At the posterior border of its convex surface, towards the upper extremity, was a mass of whitish substance, irregular in shape, and separated by a distinct edge from the splenic pulp. This extended over a space of rather more than a square inch; and, when cut into, was seen to extend inwards into the substance of the spleen for about three quarters of an inch. It was comparatively firm and dense, contrasting with the soft and different condition of the surrounding splenic pulp. Few or no traces of blood-vessels were visible in it, to the naked eye at least; it had a granular opaque texture, and was friable.

When a portion of the pulp of the spleen was examined under the microscope, with a power of 250 diameters, the following structures were seen: —1st, The usual small round granular-like cells, of which the splenic pulp is chiefly composed. 2d, The spindle-shaped fibre-cells from the trabeculæ, very distinct, and in large numbers. 3d, There were also other cells much larger than the common pulp cells, measuring about $\frac{1}{300}$th of an

inch in diameter ; round, oval, or irregular in shape, and often slightly tinged with yellow. They were filled with granules, and had besides from one to three round or oval granular nuclei in their interior. These nuclei bore a strong resemblance to the cells of the pulp. 4th, Cells of large size compared with the other cells which were seen, commonly round, but often irregular in shape, with a finely granular surface, and completely filled with smaller bodies. These included bodies varied in size from $\frac{1}{3000}$th to the $\frac{1}{1500}$th of an inch, were of a round or oval shape, and slightly granular appearance. They appeared to be the same in characters as the nuclei of the above-described, and, like them, differed in none of their characters from the cells of the pulp. These cells existed in large numbers, although not so numerous as the cells with from one to three nuclei. 5th, There were considerable numbers of delicate spherical diaphonous cells of different sizes.

1st, The white substance was found to be chiefly composed of the common cells of the splenic pulp, but very delicate and irregular in shape. 2d, There were also in large numbers the spindle-shaped cells of the trabeculæ, but very much altered, being much smaller, often without the two caudate-like processes, and destitute of the nucleus which we always find in the normal fibre-cells of the spleen. In short, they appeared to be undergoing a species of degeneration. 3d, There were also traces of the cells which we have marked 3d and 4th in describing the elements of the pulp, but much altered and degenerated. 4th, Cells of every size, from that of the common pulp cell up to the large cells No. 4, completely filled with oil granules, which refracted light powerfully, and had often a tinge of orange colour. 5th, Masses of oil granules, which were destitute of a cell-wall. 6th, Collections of granules, of different sizes, sometimes surrounded by a cell-wall and sometimes not, and characterised by their bright orange colour.

Blood.—A small incision was made into the descending cava, a little above the bifurcation, and a quantity of blood drawn out by means of a pipette. It presented a dark-brown appearance, and was not at all coagulated. On microscopic examination, it was found to contain a very great excess of colourless blood-corpuscles ; but these were still inferior in numbers to the coloured corpuscles of the blood. They measured from $\frac{1}{1500}$th to the $\frac{3}{500}$ths of an inch in diameter, presented a slightly granular surface, and contained, besides, some small globules, like oil-globules. On treatment with acetic acid, a nucleus was brought into view, which in some presented a kidney shape, in others it had a bipartite or tripartite appearance, like the nucleus of the pus-corpuscle. The colourless corpuscles had a tendency to adhere to one another, and presented themselves in masses of considerable size ; some, however, floated about free amid the coloured corpuscles of the blood.

Remarks by Mr Drummond.—With respect to the nature of the large cells which have been described as occurring in the pulp of the spleen, and containing in their interior a number of smaller bodies, I do not think that they are to be regarded as absolutely abnormal elements. I have seen similar bodies in the spleens of oxen and sheep, especially in the embryos of these animals; and in some species of fish, such as the common skate, they are very numerous and distinct. They are the same as the cells which have been described by Kölliker as cells containing blood corpuscles. Whilst examining the spleen sometime ago, it was my impression that these large cells were those in which the small bodies of the pulp were formed, and this impression receives some confirmation from a comparative study of these bodies in different animals. In the spleens of the mammalia, the bodies occurring in the pulp are of small size, and we find in like manner that the bodies contained in the larger cells are also of small size. In the spleen of the fish and reptilia, in which the cells of the pulp are twice as large as those in the spleen of the mammalia, the bodies included within the large cells present also a corresponding increase in size. Moreover, they agree in every other particular with one another,—they have the same shape, the same granular appearance, and contain sometimes a nucleolus, sometimes not. It is interesting to notice that there is also a remarkable correspondence in size between the cells of the splenic pulp and the white corpuscles of the blood in the different classes of animals.

With respect to the nature of the white deposit-like substance, there can be little doubt, from its structure, that it is only a portion of the splenic tissue undergoing degeneration. I remember a somewhat similar case which happened last summer, in which there was a portion of white firm substance about the size of a hazel nut imbedded in the centre of the pulp of the spleen, and surrounded by a firm capsule of fibrous tissue. On microscopic examination, it was found to be made up entirely of the altered elements of the splenic tissue, —the white appearance seeming to depend on the absence of blood-vessels.

CASE XV.—*Leucocythemia detected during Life; Hypertrophy of the Spleen and Liver.*

James Kerr, æt. 26, labourer, admitted into the Royal Infirmary, September 30, 1850, with jaundice and swelling of the abdomen. Has never had ague nor rheumatism. Three years ago had fever, and was ill for a month, but the character of the fever cannot be ascertained. After this illness he remained in good health till a year ago, when he states that he had occasional shiverings, and that he suffered from general pains and uneasiness, which, however, soon became localised in the abdomen. He had no vomiting then nor subsequently. About three months after the appearance of these symptoms, jaundice supervened, and has persisted more or less ever since. He has been in the house twice previously, and, on the last occasion, it is stated that the liver reached about five inches below the ribs, and that the spleen was also much enlarged. Since that time the abdomen has gradually increased in size.

On admission, there is no emaciation. Jaundice well-marked, the whole surface being of a yellowish-brown colour, and the conjunctiva pretty deeply tinged. His only complaints are of loss of strength, feeling of weakness in small of back, and sense of weight in abdomen. There is also slight pain in right shoulder, which he says dates from three weeks ago. He has no pain in the loins nor abdomen. Takes his food pretty well, but complains a good deal of thirst. Bowels rather inclined to be loose. Tongue of a florid colour, marked at the tip with several transverse cracks. Urine has been rather diminished in quantity for the last few days. There is evident enlargement of the abdomen; its greatest girth is thirty-six inches; a distinct bulging is observed in the epigastrium; both liver and spleen can be felt to be enlarged; a narrow space to the left of the mesial line, about as far across as the left nipple, can be felt between these organs. The hepatic dulness extends from the fifth rib down almost to the level of the umbilicus (about seven and a half inches), fills the whole epigastrium, and reaches to the left as far as the sulcus mentioned above. The splenic dulness reaches from the lower margin of the fifth rib to within an inch of the crest of the ilium. There is no fluid in the peritoneal cavity. The heart's action and sounds natural. An increased pulsation is distinctly visible at the root of the neck, and can be felt above the clavicles, and under the top of the sternum. Here there is a somewhat rough murmur accompanying both sounds, but heard most distinctly with the first. He has slight cough, with scanty mucous expectoration, but auscultation and percussion of lungs are natural. Urine rather scanty, high coloured, sp. grav. 1026,

contains some biliary matter, and deposits on cooling a pretty copious pinkish sediment of lithates.

Dr Robertson was good enough to analyse the blood of this case for me, with the following result :—

Specific gravity of the blood, ...	1049·5
„ „ of the serum, ...	1029·0

Composition of 1000 parts :—

Fibrin, ...	5
Solids of serum, ...	95
Globules, ...	80
Total Solids, ...	180
Water, ...	820
	1000

This man was dismissed 16th April 1851, and re-admitted 19th July. He is still in the Infirmary (31st July 1851). Since the report was taken he has been labouring under repeated attacks of diarrhœa, of shorter or longer continuance, and of epistaxis. He is also occasionally troubled with pain in the right hypochondrium. His general health has undergone little variation, and the condition of the blood has remained the same. The treatment has consisted of the liq. Iodin. c. internally, with remedies to check the diarrhœa, and occasional leeches and blisters to alleviate the hypochondriac pain.

Fig 1. Fig. 2.

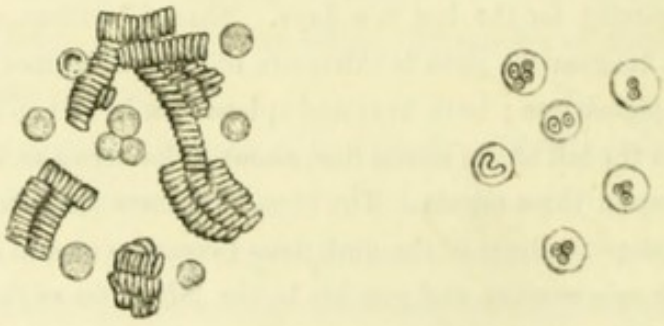

Fig. 1.—Appearance of blood in Case XV., showing the coloured corpuscles in rolls, and the colourless ones somewhat increased in number.
Fig. 2.—The same blood, after the addition of acetic acid.

Remarks.—This case appears to me interesting, as exhibiting the leading symptoms we have previously noticed as being so common in leucocythemia, conjoined with enlarged liver and spleen, while the blood presents an incipient stage of the disorder. The colourless

corpuscles were decidedly increased in number, being perhaps two or three times as numerous as in a state of health, but nothing like so much so as in Cases I. and II. The blood, however, presented the same chemical characters as those observed in some other cases in which it was analysed by Dr Robertson. It is important to observe, that, notwithstanding the long time this individual has been under observation, the condition of the blood has remained stationary, so that considerable doubts may be reasonably entertained whether the case is one of leucocythemia, or resembles those occasional instances in which the colourless corpuscles are slightly increased in number. It must be at all times difficult to draw a line of demarcation between what is to be considered within the boundary of health, or what passes beyond it. Hence I have placed this amongst decided cases of leucocythemia; but shall dwell more particularly on the facts it presents to us in the second part of the monograph.

II.—CASES WHICH HAVE BEEN PUBLISHED BY VARIOUS AUTHORS.

The following cases have been published in the various journals, domestic and foreign. They are slightly condensed, for the sake of brevity, although care has been taken to retain all the essential facts. I have also indicated where the original observations may be found.

CASE XVI.[1]—*Leucocythemia detected after Death; Hypertrophy of Spleen and Liver.*

Peter Campbell, æt. 30, a weaver, was admitted into the Royal Infirmary, February 24, 1841, under Dr Craigie, with symptoms of feebleness, impaired health, and diffused swelling of the belly. He first felt hardness and swelling in the left epigastric and hypochondriac regions four months previous to admission, which continued to increase gradually until the last three weeks, dur-

[1] Edinburgh Medical and Surgical Journal, vol. lxiv., p. 402.

ing which time it has remained stationary. On entering the hospital, the belly was uniformly swollen and prominent, soft and elastic on the right side; but, on the left, hard, resisting, and solid. In this position there was felt a tumour, with a distinct circumscribed edge, having its upper part as high as the epigastrium, where the edge is hollow, and does not cross the linea alba. Below, it crosses the linea alba, and forms a prominent border, extending about an inch on its right side. Its lower edge is rather irregular, being prominent below the umbilicus, but receding towards the left hypochondriac region. He has never had vomiting, shivering or chills, but has perspired freely during the night. Pulse from 92 to 96 in the minute. Respiration impeded, and laborious on exertion. Bowels stated to have been confined, but latterly regular. Purgatives, and subsequently a course of the ioduret of iron, were ordered. The purgatives produced numerous stools. On the 23d, it is stated that the bowels were moved three times daily. Diaphoresis continues. On the 25th he had headach, followed by marked febrile symptoms, for which he was bled to fourteen ounces. Delirium and insensibility supervened, for which blisters were applied afterwards to the head, and saline mixtures and purgatives given. He died April 1st.

Sectio Cadaveris—April 1st.—The spleen when removed weighed seven pounds three ounces and a-half. The greatest length was eleven and a-half inches; its circumference at the broadest part fifteen inches. On section, its substance was firm, and the cut surface presented many whitish bodies, seemingly forming numerous septa between the red matter. The liver weighed six pounds three ounces; its structure was normal. Kidneys were healthy. Many of the isolated intestinal follicles were distended so as to present prominences the size of millet seeds. The pulmonary organs were healthy, with the exception of a small hepatised portion of the lower lobe of the left lung. The vessels on the surface and at the base of the brain contained whitish coloured bodies, like pieces of lymph, which could be moved backwards and forwards by compressing the veins. In the cavities of the heart and the large veins, the blood presented exactly the same appearances as were presented in Case I.; and Dr Reid, at that time pathologist to the Infirmary, on examining the blood with the microscope, found it to contain globules of purulent matter and lymph.

Remarks.—I have placed this case among those in which the blood was physically examined, notwithstanding the imperfect account given of the appearances observed under the microscope, because there can be no doubt that the individual laboured under

leucocythemia. No mention is made of the condition of the mesenteric and lymphatic glands in this case. The other appearances were identical with those noticed in Case I. The account says nothing of epistaxis or hemorrhage from the mucous membranes. The bowels were freely moved during most of the period he was in the house; but as purgatives were liberally administered, whether this symptom resulted only from their action, or depended on the disease, becomes difficult to determine. Fever latterly was well marked, with head symptoms, including delirium and insensibility.

The three following cases have been published by Virchow :—

CASE XVII.[1]—*Leucocythemia discovered after Death; Hypertrophy of Spleen; Diffuse Suppuration of the Hands.*

On the 1st March 1845, the patient (a female cook, æt. 50) was admitted into the Charité Hospital, Berlin, who had become affected a year before with swelling of the inferior extremities and abdomen, with severe cough, expectoration, and abdominal pain. In summer 1844, the cough disappeared, but came on again in autumn, along with severe diarrhœa. This again ceased, but subsequently reappeared, with bloody evacuations. There was slight œdema of the inferior extremities; the abdomen was swollen and fluctuating; the spleen was greatly enlarged, and somewhat painful; the cough frequent; expectoration copious. Rattling murmurs were heard in the chest; appetite good; urine scanty; great emaciation; pulse, 98. The diarrhœa was checked by treatment. Afterwards repeated epistaxis came on. In May, pain began to be felt in the region of the spleen, with costiveness. In the night of the 8th June the patient had a severe epistaxis, after which a furunculous eruption appeared on the nose, and between the thumb and index fingers of the right hand. On the 6th of July copious hemorrhage from the nose returned. On the 15th, a red and painful swelling of the skin was observed over the palmar surface of both hands, on which blisters, with purulent contents, formed, and opened themselves, assisted by warm fomentations. Subsequently an incision through the skin became necessary, from which a quantity of discoloured pus escaped. On the 29th July, diarrhœa suddenly supervened, the patient rapidly sank, and died on the morning of the 31st.

[1] Schmidt's Jahrbücher. Januar 1848.

Sectio Cadaveris.—August 1.—Diffuse suppuration in the neighbourhood of the incisions on the hands; lymph and blood-vessels of the arm normal, but the superficial veins contained a dirty yellowish, badly coagulated clot. Almost all the vessels contained pus-like masses. The somewhat hypertrophied heart contained large, loosely-lying, greenish-yellow white clots, of the consistence of pus. Similar coagula were found in all the large vessels, arterial and venous. In veins which had thin coats, such as those of the brain, the contents presented the appearance of solid whitish strings, which, however, were always free, and nowhere attached to the vascular walls. Liver normal; spleen enormously hypertrophied, a foot long, very heavy, and of a dusky brown-red colour. It was extremely resistant, brittle in texture, displaying little blood on section, homogeneous, slightly lustrous, resembling the condition observed in fever. Kidneys normal, excepting uric acid concretions in the pelvis and ureters.

Remarks.—This case bears a close resemblance to the first related in most of the post-mortem appearances, especially the aspect of the blood in the blood-vessels generally, and on the surface of the brain. The state of the lymphatic glands, however, is not mentioned. The principal symptoms were diarrhœa, hemorrhages from the mucous membranes, and local suppuration over the hands. It is not distinctly stated that a febrile state was present, although the inflammatory phenomena noticed render this probable. I have copied the account from Schmidt's "Jahrbücher," the journal in which the case was originally published not being accessible to me.

CASE XVIII.[1]—*Leucocythemia detected after Death; Hypertrophy of the Lymphatic Glands generally and of the Liver; Hydrothorax, Pneumonia, Bronchitis.*

Aug. Schulz, locksmith, from Potsdam, a very strongly built man, stated that he has frequently before suffered from inflammation of his lungs. For nearly two years he has observed a painful and gradually increasing swelling of the glands on both sides of his neck, as far as the angle of the lower jaw, and downwards to the shoulder. At the same time, frequently-returning and very violent constrictions of the chest came on, producing the greatest diffi-

[1] Archiv für Pathologische Anatomie und Physiologie. Band. I. P. 567.

culty of breathing, and at night especially he coughed often and expectorated with difficulty. Gradually the body became swollen, the appetite impaired, whilst the thirst was increased. It was difficult to obtain fæculent discharges, although masses of mucus were passed continually. The patient felt very depressed and weary, active febrile symptoms appeared, and his sleep became disturbed. When, on the 26th June 1849, he was received as an out-patient of the Charité Hospital, Berlin, under the care of Herr Grimm, large swellings existed in the neck, axillæ, and groins, which were uneven, nodulated, not painful, very soft, but not fluctuating. In the cavity of the abdomen it was thought that enlarged glands could be felt, although a co-existent effusion of fluid made the examination difficult. Respiration was hurried ; cough frequent, with mucous expectoration. At the inferior right lobe of the lung there was bronchial respiration, of considerable extent. On the left side mucous râles spread unequally over the middle portion of the lung. Externally, frictions of oil of turpentine on the chest ; internally, Senega c. Amm. Mur., and Liq. Am. anis. This produced slight amelioration, but very soon fresh attacks of dyspnœa came on. Tr. Opii croc. c. Syr. Altheæ. The dyspnœa increased so rapidly, that at two o'clock in the morning of the 2d August, death took place with symptoms of suffocation.

Sectio Cadaveris, eighteen hours after death.—Body little emaciated. The whole region of the neck, from the clavicle to the ear, the axilla, and groin, on both sides, presented large, irregular, nodulated tumours, which had the soft and elastic feeling of lipoma. This was found to be owing to enlargement of the lymphatic glands, which, in the groin, had swollen to the size of large plums. More precise examination showed that this was simple hypertrophy. On making a section, a reddish-white, somewhat lax parenchyma was seen, from which a slightly muddy watery fluid exuded on pressure. In the lymphatic glands of the groin especially, not only was there enlargement of the peculiar external gland substance, but also of the connecting tissue in the interior, which gives them a peculiar kidney-like appearance. Microscopic examination showed the usual constituents,—namely, round, tolerably large, very granular nucleus corpuscles, the nucleus unaffected by acetic acid. More rarely finely granular cells having similar nuclei with several molecules between them. These enlargements extended throughout the whole system of lymphatics as far as was examined, but existed mostly in the interior of the body. The lumbar mesenteric and epigastric glands formed similar large nodulated tumours. In the anterior mediastinum and the pelvis masses of glands of extraordinary size were found. The pelvis was laterally quilted with gland substance on both sides, which seemed owing to the glands placed along the iliac vessels. The

thoracic duct was packed in the substance of the gland, from its entry into the thorax to its termination, in such a manner, that it was difficult to recognise any division of the whole into individual tumours. Anatomical and microscopical examination nowhere showed any alteration of the structure of the glands. The lymph vessels were larger than normal, but not remarkably so, and contained a fluid almost as clear as water.

The spleen showed no alteration, except it were that the pulp was a little more compact than usual. The liver was much enlarged ; and in its dusky-brown parenchyma, especially at the inferior portion of the anterior margin of the right lobe, a few white points were observed, of about the size of the normal liver lobules, and so embedded in the tissue, that they appeared as if substituted for lobules. In one place a larger grain was found, as large as a pea, of a pale white colour, neither projecting above nor depressed below the surface. On cutting through them a white fluid escaped from all these bodies, which showed, under the microscope, the nuclear elements characteristic of lymphatic and blood glands. They could be taken whole, without tearing, from the parenchyma with tolerable facility. If broken under the microscope, and then compressed, they presented the appearance of the Malpighian corpuscles of the spleen, a scarcely fibrous, almost structureless, membrane, and a dense mass of gland-nuclei. In the rest of the abdominal viscera nothing else unusual or of importance was found. There was slight serous effusion in the abdominal cavity.

Thyroid gland was normal. The bronchial glands hypertrophied. In the right pleura a considerable amount of clear watery effusion. Inferior lobe of right lung compressed and collapsed. Inferior lobe of left lung solid, collapsed, granular, and pale-red on section. In both lungs marked bronchial catarrh, with abundant mucous secretion.

There was some watery fluid in the pericardium. Heart normal, except that the right side was distended very considerably with blood. On opening the cavity of the heart, a thick, creamy, white, or slightly yellow mass was immediately expelled, so uncommonly like pus, that one of the bystanders believed that I had opened a large abscess in the heart. More careful examination showed that this was the blood, which had coagulated in the right side of the heart in such a manner, that it presented a red and a white clot, one under the other. The proportion of the one to the other could not be exactly determined ; we may, however, consider two to three as an approximation. Microscopic examination showed that the white clot, besides a spare admixture of fibrin, consisted only of colourless nuclear and cellular structures, which only differed from the elements found in the lymphatic glands, in that the cells were proportionally more numerous. Besides these, numerous very small molecules occurred. The red clot, which presented to the naked eye a slight tinge of

grey, contained, besides normal red blood corpuscles, very numerous coloured structures. The rest of the vascular system contained sometimes more red clots, sometimes more white,—upon the whole, having the greatest number of white corpuscles.

Remarks.—This must certainly be regarded as a very remarkable case, presenting all the phenomena observed in the condition of the blood, recorded in Cases I. and IV., without enlargement of spleen, but instead, great hypertrophy of the lymphatic glands distributed throughout the body. Virchow also speaks of certain free nuclei in the blood, the nature of which, without a figure, it is very difficult to understand. We have previously seen, however, that in Case I. the lymphatic glands were enlarged, and the appearance of their cell-elements is represented Fig. 5. I presume that these with their nuclei free are the bodies to which Virchow alludes. The case proves that leucocythemia may be produced independent of enlargement of the spleen, although hypertrophy of other glands, abounding in similar cell-elements, seems necessary. The shut sacs, resembling the Malpighian bodies of the spleen, found in the liver, constitute altogether a new production, unlike anything observed before or since. No tendency to hemorrhage from the mucous membrane is noticed in this case, the whole of the symptoms being pulmonary, evidently associated with the lesions which existed in the lungs.

CASE XIX.[1]—*Leucocythemia detected after Death; Hypertrophy of Spleen and Lymphatic Glands; Tuberculosis.*

Heinrich Hoensch, journeyman joiner, ætat. 38, received into the Charité Hospital, Berlin, February 28th, 1848, under Professor Wolff. Seventeen years ago he suffered from an intermittent fever of ten weeks' duration. Four years ago, in consequence, as he says, of cold, he felt a stitch in the left side of his abdomen, together with diarrhœa and abdominal pain. These symptoms disappeared and returned at intervals. Nine months after they were more constant, and two months since the large swelling was first observed, which occu-

[1] Archiv für Pathologische Anatomie und Physiologie. 2te Band. P. 587.

pied the whole left side of the abdomen. Its margins were easily determined, and pressure caused no great pain. Diarrhœa continued; the appetite was normal; he sleeps well, and is somewhat debilitated. In the middle of March headach and epistaxis appeared and frequently returned. On the 26th he lost a quart of blood by epistaxis, which was arrested by plugging, but produced great weakness. During April there was no recurrence of bleeding. The pulse rose gradually, and the strength improved; the tumour also diminished. He had an anemic appearance, and was very fretful, and left the hospital on the 13th of June. He returned in a fortnight. Slight fever came on, which increased, and after the 21st July there was an evening exacerbation. The tumour again enlarged, and slight epistaxis returned. Accurate examination showed that the tumour was from half an inch to an inch larger in diameter in the morning than in the evening. Pulse in the morning was 104, in the evening 120; urine contained a considerable sediment of urate of ammonia and phosphates. The fever became aggravated, with occasional epistaxis, till October, when headach, dizziness, dyspnœa, cough, with deep inspiration, came on. There was diminished respiratory murmur in the left breast inferiorly, and in one part crepitation. 10th October, he was cupped on the affected part. Pulse frequent, especially in the evening; there was cough, with deep inspirations; the sputa were tenacious and rusty coloured. The symptoms went on increasing till, on the 26th October, copious bilious diarrhœa supervened, the fever continued, and he died on the 2d of November.

Sectio Cadaveris.—Body emaciated—fat disappeared. The internal table of the cranial bones was thickened by osteophytic deposits. In the longitudinal sinus the blood presented somewhat of a greyish coagulum. Considerable effusion of serum in the enlarged ventricles, the walls of which were softened by imbibition. The capillaries presented no apparent accumulation of colourless blood-corpuscles. Thyroid gland tolerably large and pale. A few tubercles in the right lung. Recent tuberculosis of left lung and pleura, with fibrinous exudation. In the heart, which was normal, were a great many fragmentary coagula, which presented an inferior mass, moderately thick and red, and a superior one, like coagulated pus, of a white colour. These clots were continued into the arteries. In the veins was fluid grayish-red blood, along with similar yellowish-white clots. Examined microscopically, the red blood-corpuscles were mixed everywhere with numerous colourless ones, which in the white clots occurred almost alone, or were associated with fatty molecules. The colourless corpuscles were of the usual size, slightly granular, displaying, with acetic acid, single nuclei or several small ones, with all intermediate gradations. Very often the transition forms were horse-shoe shaped or crescentic. The spleen occupied

the whole side of the abdomen, and the diaphragm was adherent to its upper surface. Externally it was very firm, bluish-red, and at its outer margin were two yellowish-white tubercles. On section, it was homogeneous, pale grayish-red, almost flesh colour. By careful examination it displayed small white corpuscles. Pulp very resistent and dense. When examined microscopically, there was found, among normal cells and nuclei, a slightly granular mass of exudation. Liver, with exception of small tubercles, normal. Kidneys flabby, with miliary tubercles. Epigastric lymphatic glands enlarged, flabby, somewhat œdematous. Internal mucous membrane presented here and there tubercular ulcerations.

Remarks.—In this case, associated with the leucocythemia, there was enlargement of the spleen, without hypertrophy of the liver. The lymphatic glands are said to be enlarged and œdematous. Whether they were, or were not, similar to the hypertrophied glands formerly noticed, is not stated. Tubercular exudation existed also in various tissues, and especially tubercular pleurisy. Here, again, we observe epistaxis to be a leading symptom, followed by fever and copious diarrhœa.

CASE XX.[1]—*Leucocythemia discovered during Life; Hypertrophy of Spleen.*

Johanna Sheen, aged 69, a fruit-seller in the streets, was admitted into the North London Hospital under the care of Professor Parkes. Has never had any serious illness or malarious disease. Towards the end of 1848 had swelled feet, and shortly afterwards pain in the left side of abdomen. She then first perceived a considerable swelling below the false ribs on the left side. She had no sickness, shivering, or fever. She entered the hospital in January 1849, and remained under treatment there (blisters, iodide of potassium, and morphia) until the end of February, when she was discharged. On several occasions during this period she had morning sickness, and vomited a little blood. In November, when in the street, she was knocked down by a cart, and suffered some pain in the abdomen for four weeks in consequence. On re-admission, December 13, 1849, " we found her thin and shrivelled, without œdema or enlargement of veins; there was a peculiar dusky, yellowish-brown colour of the skin, most evident on the trunk,

[1] Medical Times, June 8, 1850.

and less marked on the face and extremities; the conjunctivæ were clear; there were no head symptoms; and no pulmonary symptoms, with the exception of a little dry friction low down on the left side; there was a feebly acting heart, in its right position, and without bruit; the pulse was 72, regular; the radials not visible. A large tumour, evidently an enlarged spleen, filled the left side of the abdomen, descending from the lower border of the seventh rib, nearly to the ilium, bulging into the posterior left lumbar region when she lay on her back, and reaching nearly to the umbilicus on the right; falling over considerably to the right of the umbilicus when she lay on the right side; with a prominent, rigid, smooth, lower border; very hard throughout, and tender; the extreme length of the dull percussion-note was 8 inches; no splenic murmur was ever audible. The height of the hepatic dulness (vertical line from nipple) was $4\frac{3}{8}$ inches; the lower edge was $1\frac{3}{4}$ inch below the false ribs; to the left of the middle line the hepatic dulness confounded itself with the splenic, that is to say, with the dulness of the tumour. There was no fluid in the peritoneum, no nausea; the appetite was good, the tongue clean; there were no intestinal or uterine symptoms. She had had no epistaxis at any time; no hæmoptysis; a little hæmatemesis, apparently, when she was in the hospital previously; no melæna, hæmaturia, or mennorrhagia.

"During the patient's stay in hospital, viz., till the 17th of March, she remained nearly in the same condition. Occasionally she suffered from severe frontal headaches; she also had, on several occasions, sharp stabbing pains in the abdomen, both over the spleen and liver, for which leeches were applied, the bleeding from which was profuse and not very easily arrested. On four or five occasions, also, she had moderate shivering, followed by heat and sweating; these attacks were not very regular, seemed to observe no certain times, and were separated from each other by long intervals. On the 27th of February, according to her own account, she passed a pint of blood with a stool; but this, and another stool passed subsequently, were thrown away accidentally, and were not seen by any one; the next stools were free from blood. With this exception, she had no bleeding from any part of the body, and none into the substance of the skin. On the 17th of March the patient left the hospital, nearly in the same state as on admission."

Blood drawn from the finger evidently presented, from the excellent description given by Dr Parkes, the same appearances represented in Figs. 6 and 7.

The venous blood was analysed on two occasions, by a process closely resembling that adopted by Dr Robertson of Edinburgh in the cases previously recorded. On the 20th December, the blood being taken three hours after food, when its composition in 1000 parts was as follows:—

Fibrin (with probably adherent white corpuscles), ...	7·08
Red particles, with a number of white corpuscles which could not be separated, ...	101·63
Coagulable organic matters of serum, ...	63·03
Incoagulable, ...	3·08
Soluble salts of the serum, ...	8·63
Insoluble salts of the serum, ...	·48
Water, ...	816·07
	1000·00

"The composition of the serum was as follows. The reaction was strongly alkaline:—

Coagulable organic matters, ...	70·71
Incoagulable, ...	3·46
Soluble salts, ...	9·68
Insoluble (obtained by incinerating the dried albumen), ...	·55
Water, ...	915·6
	1000·0

"A small portion of serum was examined for uric acid in the ingenious method devised by Dr Garrod, viz., by the addition of a little acetic acid to a portion of serum in a watch-glass, at the bottom of which lies a fine hair. No crystals of uric acid could, however, be perceived.

"On the 15th of February the patient was bled again three hours after food; the fibrin was estimated by washing the clot. The composition was as follows:—

Fibrin (with probably adherent white corpuscles), ...	4·75
Red particles (with undetermined white corpuscles), ...	97·73
Organic solids of serum, ...	69·27
Inorganic solids of serum, ...	8·25
Water, ...	819·8
	1000·00"

The urine was subjected in this case to a series of careful observations, but nothing unusual was observed.

Remarks.—In this case, which was under careful observation for three months and a-half, there were observed occasional slight accessions of fever, but none of the epistaxis, or violent hemorrhages

and diarrhœa, we have seen to constitute such leading symptoms in previous cases. At one period, indeed, she is said to have had hematemesis, and at another a bloody discharge from the bowels; but the latter is doubtful. The further progress of this woman's case is a matter of some interest. As regards the analyses of the blood, they show increase of the fibrin, and very slight diminution in the amount of the corpuscles,—in the latter respect exhibiting a marked difference from the results obtained by Dr Robertson in the Edinburgh cases.

The two following cases are recorded by Dr Fuller:—

CASE XXI.[1]—*Leucocythemia detected during Life and after Death; Hypertrophy of Spleen and Liver.*

On the 31st December 1845, a man was admitted into St George's Hospital, who had been seized eight months before with dyspeptic symptoms. Six weeks later, a small, firm, painless tumour appeared in his left hypochondrium, which in three months rapidly increased. The dyspnœa continued, he lost appetite, occasional vomiting came on, and his bowels were costive. There was constantly recurring bleeding at the nose, and since the middle of December diarrhœa has continued. He died on the 8th of January 1846.

Sectio Cadaveris.—Spleen and liver very much enlarged. All the blood-vessels enlarged, and the blood grumous, of a remarkable gray colour.

The blood which was examined before death showed, besides its normal corpuscles, abnormal spherical bodies, of a finely granular appearance, colourless, without visible membrane or nucleus; some of the usual size of corpuscles, others much larger. They were so numerous that they formed about a quarter of the whole sum of the corpuscular elements of the blood. The splenic artery and vein, like all the portal veins, were much enlarged, and filled with half-coagulated blood, of the consistence of soft spleen pulp, but of a peculiar gray-red colour.

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[1] Lancet, July 1848.

CASE XXII.[1]—*Leucocythemia; Encephaloid Tumour of the Abdomen.*

An encephaloid tumour of the abdomen was removed from a girl, nine years of age, who became an out-patient, under Dr Fuller, at St George's Hospital, in February 1850. She had enjoyed tolerable health till July. In a few weeks after this a tumour was perceived projecting from under the ribs on the left side downwards towards the pelvis. It increased very rapidly, and pressed upon the rectum and neck of the bladder,—thus producing much distress. When brought to the hospital, the abdomen was enormously enlarged, the right side tympanitic, the left dull on percussion. Protruding from under the ribs on the left side, and causing them to bulge considerably, was a firm, solid tumour, which could be traced down the abdomen on the left side, dipping into the pelvis, its anterior margin being irregular. It was regarded to be an enlarged spleen. She was greatly emaciated, and her legs œdematous. She died on the 30th of March.

The encephaloid tumour was seen occupying the whole of the left side of the abdomen. Superiorly it pressed against the diaphragm, and encroached considerably upon the thorax. Inferiorly it dipped into the pelvis between the rectum and the bladder. It was irregularly oblong, knobby on its surface, and larger at its superior than inferior extremity. It weighed four pounds nine ounces. Its cut surface was in most parts of a cream colour, firm and elastic to the touch, but in parts of a dark mottled appearance, and somewhat softer. The bladder was greatly distended, and was above the brim of the pelvis. The ureters were considerably dilated, also the pelvis of either kidney. The structure of the kidneys was much diminished by pressure. The other viscera healthy.

The tumour itself presented nothing of particular interest, but showed that a condition of the blood, which had been supposed peculiar to certain forms of disease of the spleen, may be seen in other disorders. The peculiarity consists in the presence of large numbers of colourless, granular, spheroidal globules, varying in size from that of a common blood corpuscle to twice or three times that size, as shown by actual admeasurement. Whether these globules be merely the colourless corpuscles of the blood in an altered condition, or altogether of abnormal production, there can be no doubt that their presence is indicative of an unhealthy state of the blood. These globules Dr Fuller had observed in every case of enlarged spleen, unconnected with ague, in which

[1] Report of the Proceedings of the Pathological Society of London. Fourth Series. Pp. 224, 225.

the blood was examined ; and satisfied by repeated examination that they do not exist in the blood of persons having enlargement of the spleen as the result of ague, he had supposed them peculiar to that form of enlargement of the spleen which occurs independently of malarious influence. But as the same condition of blood was found in this case, it is obviously not peculiar to, or diagnostic of, the disease alluded to ; and it becomes a question of considerable interest as to the conditions under which these globules make their appearance.

Remarks.—These notices of cases leave much to be desired. Still the facts mentioned are important. With regard to the latter case, I was anxious to ascertain the nature of the tumour and a few other particulars, which Dr Fuller was so good as to give me in the following note :—

" I have much pleasure in replying to your queries respecting the case of encephaloid disease reported in the last vol. of the ' Transactions of the Pathological Society.' The tumour was not examined microscopically ; for I performed the post-mortem examination only a short time before the meeting of the society, and from some mismanagement, I was unable to regain possession of the preparation when I sent for it on the following day. My other answers however, are more satisfactory. The poor child had frequent hemorrhage from the bowels, the nates, and the mucous membrane lining the trachea and bronchi ; her gums, too, were spongy and bled occasionally. There was *no* enlargement of the mesenteric glands, or of the lymphatic glands in any part of the body ; but she had great irregularity of bowels, which were occasionally relaxed but more generally costive. I have now discovered this condition of the blood in six cases,—four of which were cases of enlargement of the spleen, unconnected with ague or malarious influence. One was the case of encephaloid disease reported in the ' Pathological Transactions,' and one a case which I have now lost sight of,—of a tumour, still apparently solid and immoveable, situated on the left side of the epigastric region, which may possibly have been an enlarged spleen. This case, however, when I was watching it, about three years since, was in its early stage. The patient, a married woman, was apparently in good health ; her digestive functions had not materially suffered, nor had her gums become spongy, nor had she had hemorrhage from any of the mucous membranes. Much difference of opinion existed among those who saw her as to the nature of the tumour ; and this it was which induced me to examine the condition of the blood. The colourless corpuscles were not at that time numerous, but they were of very large size."

CASE XXIII.[1]—*Leucocythemia detected during Life and after Death; Hypertrophy of the Spleen, Liver, and Mesenteric Glands.*

Christian Kratz, æt. 34, a sailor, entered the Giessen Hospital, under Professor Vogel, 8th July, 1850. Two years ago there appeared a glandular swelling under the right angle of the jaw, which, on the application of lotions, disappeared in eight days. He then, for the first time, observed a slight enlargement of the abdomen, which gradually increased in size. Some time afterwards, the swelling under the jaw again appeared, suppurated, and was opened, giving exit to a considerable quantity of pus, after which it healed up. The enlargement of the abdomen progressed, accompanied by pain, increased from time to time. Cough, expectoration, and difficulty of breathing came on. The appetite diminished. After eating, pain in the abdomen and dyspnœa were excited; the stools were sometimes normal, at other times there was diarrhœa. For some months past, the abdominal swelling has increased with rapidity. He has never had intermittent fever or syphilis.

On admission, the patient is emaciated, but the countenance, though not healthy, cannot be said to be anemic. Pulse 84, full and hard. There is considerable dyspnœa; cough, with muco-purulent expectoration. On percussion, slight dulness under the right clavicle, and, on auscultation, tubular breathing and increased vocal resonance in this situation. Posteriorly and inferiorly over both lungs, fine and coarse moist râles are distinctly heard. The tongue is coated; appetite bad; considerable pain in the epigastrium, extending into the right hypochondrium; increased after meals, and on pressure. Since yesterday, strong pain in the right iliac region, also increased on pressure. The abdomen is protruded, and its superficial veins greatly developed. In the left side may be felt a large resisting swelling—evidently the spleen—which, coming from the left hypochondrium, extends inferiorly to the sacrum (darmbein), its anterior margin reaching forwards to the umbilicus. Pressure upon it produces pain. The liver is also greatly enlarged, extending from the seventh intercostal space above to the sacrum (darmbein) inferiorly, its left lobe coming in contact with the spleen. There is diarrhœa; and he has a few hæmorrhoidal swellings round the anus. The urine is normal in quantity, with a copious sediment of uric acid. The inguinal glands on the right side are slightly enlarged.

The blood presented its usual appearance when drawn from the arm, but in

[1] Condensed from Virchow's Archives. Band 3. Seite 570.

four hours exhibited a colourless layer superiorly, like cream. In twenty-four hours, it had separated into two portions, the upper half milk-white, the under dark red. The former contained corpuscles of the size, appearance, and reaction of pus corpuscles (from the minute description given, they were evidently the same as those previously described). The colourless cells appeared one-third or one-half as numerous as the coloured ones. A portion of the blood was allowed to coagulate, which it did in the usual manner. The upper part of the clot, however, presented a whitish layer, resembling white granulations. These consisted of aggregations of colourless cells. The serum was copious and clear, without a trace of milky opalescence.

The blood was analysed in Liebig's Laboratory by Dr Strecker, and yielded

Fibrine, . . .	4·46
Solids of Serum, . .	82·35
Globules, . . .	97·39
Total Solids, . .	184·20
Water, . . .	815·80
	1000· 0

Up to the 19th of July, the symptoms underwent no change. The pulse then became more rapid (110), the thirst increased, the appetite remaining bad. Œdema of the feet and scrotum appeared, and a miliary eruption on the breast and abdomen. The dyspnœa increased, the urine had a strong acid reaction, although the uric acid sediment was diminished. The occasional diarrhœa continued. On the 25th of July, the pain in the splenic region increased, and from this period hectic fever was present, with profuse sweating and diarrhœa; and, notwithstanding the use of various remedies, judiciously administered, he died August 4th.

Sectio Cadaveris, twenty-six hours after death.—The body was greatly emaciated, and the increased size of the spleen was visible under the abdominal walls.

Head.—Fluid blood in the longitudinal sinus. The corpora striata, thalami, and corpora quadrigemina very soft. Brain otherwise healthy. No serum in the ventricles.

Chest.—The lungs were slightly infiltrated with serum at their posterior and inferior portions. No trace of tubercle. The pericardium contained much bloody serum. The venæ coronariæ unusually distended with blood. The cavities of the heart, as well as the aorta and pulmonary artery, were filled with blood of the consistence of syrup, containing greyish-white soft

coagula. The empty heart was soft, valves normal. At several points of the trabeculæ small masses of coagulated fibrine were attached. The thyroid gland was normal.

Abdomen.—The mesenteric glands consisted of white masses the size of a bean, containing, as determined by the microscope, numerous fat globules and granules. The mesenteric veins were distended to the size of the finger, with blood of the consistence of syrup, containing soft white flocculi. The liver was enlarged, and weighed five pounds thirteen ounces. On section, the parenchyma presented a homogeneous greyish red colour. Its cells were normal. The spleen occupied the entire left half of the abdominal cavity. It was twelve inches long, seven inches broad, and four and a-half inches thick; and weighed five pounds three ounces. The surface is smooth, and of its usual colour, only at the upper end covered with white fibrous exudations, and united to the peritoneum. On section, the parenchyma presented the usual appearance, and its structure, when microscopally examined, was also normal. The splenic vein was distended with the same blood as was found in other vessels. The kidneys were healthy. The suprarenal glands consisted of masses of cheesy consistence, owing to fatty degeneration.

The blood was carefully examined in various parts of the body, especially in the cavities of the heart, portal vein, the ascending vena cava, and iliac vein. The fluid blood from the heart, in addition to the colourless cells formerly noticed, contained nucleated fusiform cells, similar to those found by Virchow in the blood. The coagula were soft, partly white, and partly dark red; the former containing, under the microscope, amorphous granular masses, with several colourless blood corpuscles. The ashes of this blood were determined by Dr Strecker to contain, in 100 parts, 3·42 of oxide of iron.

Remarks.—This is a remarkably well observed case, the general symptoms, structural lesions, and chemical composition of the blood being similar to what we have previously seen to exist in many similar cases. A new fact, however, was elicited by analysing the ashes of the blood after death, and determining that the amount of iron was decreased—a result to be anticipated from the comparative diminution in the coloured corpuscles.

III.—CASES IN WHICH THE EXISTENCE OF LEUCOCYTHEMIA IS PROBABLE, ALTHOUGH, FROM THE BLOOD NOT HAVING BEEN EXAMINED MICROSCOPICALLY, THIS CANNOT BE POSITIVELY DETERMINED.

There can be no doubt that cases of leucocythemia have often occurred, although the condition of the blood was not accurately determined. Were the records of medicine, indeed, carefully investigated, it is highly probable that many instances of the disease might be discovered, although as the information so obtained could lead to nothing positive, such investigation would scarcely repay the toil it would occasion. A short notice of the most important of such cases as are known to me, however, may here be given :—

CASE XXIV. By Bichat.[1]—At the examination of a body in the Hôtel Dieu, Bichat found, among the black abdominal blood, true purulent matter of a green colour, which so filled up all the branches of the splenic vein, the trunk of the vena portæ, and all its branches in the liver, that the pus they contained was sufficient to distinguish all the branches of the portal from those of the cava system, which contained normal blood. The body had, besides, a very extraordinary *embonpoint*. This was evidently not a merely post-mortem appearance, and there could be no doubt that the blood had circulated in a state, if not so much altered as it then appeared, yet very different from natural.

CASE XXV. By Velpeau.[2]—A lemonade-maker, æt. 63, who was addicted to drinking and loose habits, had had weakness in the back, when thirty-four years old, which hindered his stooping ; but had become stronger. In his fifty-fifth year a very severe cough came on. Two years after he fell down stairs on his right side, which accident was followed by great pain and fever, of which he was relieved in six weeks by antiphlogistic treatment. For five years he scarcely suffered at all from cough ; but at that time he had symp-

[1] Anat. Génér. Paris, 1801. I., 65. [2] Révue Médicale. 1829. II., 218.

toms of stone, which were relieved by baths and diuretics. A year after there was swelling of the left side of the abdomen. A pretty firm painless tumour was felt, which increased without pain up to December 1825. From this period the patient's general health was deteriorated; he lost flesh, had slight wandering pains, and from time to time some little fever, but good appetite. On the 16th of February he had a sudden seizure. His countenance was livid; and an hour after, the left limbs were insensible, and the whole head painful. On the 18th he was admitted into the hospital. Countenance and whole skin were livid; the senses and respiration normal; the abdomen hardly at all painful, with two enormous tumours. Pulse small, irregular. Movements of the extremities not difficult, but somewhat restrained; and the head heavy. In the evening he became decidedly worse; in the night gave a sudden shriek; and died at three o'clock next morning.

Sectio Cadaveris.—The spleen occupied the whole left hypochondrium and side of the abdomen. It weighed ten pounds, and had a cartilaginous spot on its surface. The structure was as dense as that of the liver, without marked alteration. The liver was twice as large as usual; of its normal texture. In the heart, aorta, vena cava and its branches, and especially where the vessels were large enough for examination, thick blood was found, of the consistence of jelly, in which respect, and in its colour, it resembled the lees of red wine, and scarcely any of it was either fluid or coagulated. It became a question whether it were not rather laudable pus, mixed with blackish colouring matter, than blood. It resembled very much the reddish or black-brown pulp, into which one can break down many softened spleens. Chevreul kept some blood for examination, but it became decomposed too soon.

CASE XXVI. By Bessiere.[1]—A man, æt. 60, was afflicted with a very remarkable hypertrophy of the spleen (which weighed 6250 grammes), the liver and kidney being also to a less extent enlarged. He suffered from it no more than a mechanical inconvenience. He was treated with calomel, gr. iv., daily. Four days after he was affected with smart fever and dyspnœa, and died suddenly.

Sectio Cadaveris.—Excepting the above-mentioned hypertrophy, all the organs were healthy. The heart, however, was slightly hypertrophied in its ventricles. It contained a jelly-like clot, of a white colour. Similar clots were contained in the aorta, the pulmonary arteries, and in the whole arterial

[1] Canstatt's Jahresbericht. 1845. I. S. 26.

system. The vena cava contained smaller similar clots. These were submitted to chemical analysis. This gave, in 1000 parts,—

Water, ...	867·7
Albumen, ...	82·7
Fibrine, ...	22·1
Fat and extractive matter, ...	20·4
Salts, ...	2·1
Loss, ...	5·0
	1000·0

CASE XXVII. By Rokitansky.[1]—In the body of a locksmith, æt. 33, were found, both in the smaller and larger blood vessels of the lungs, yellow-green tenacious blood-coagula, as well as greenish-yellow fibrin-coagula, in the heart-cavities and great vessels. The liver was much enlarged (six pfd. eight lth), pale, tallowy, poor in blood, and containing a muddy purulent fluid. The spleen was very heavy (five pfd. eighteen lth), dense, bacony, and infiltrated with brown red blood.

CASE XXVIII. By Oppolzer and Leehmann.[2]—The patient, a woman æt. 24, was delivered of her first child several years ago. The catamenia returned at the usual period, but she suffered under continuous uneasiness of the abdomen. Diarrhœa alternated with costiveness; the body increased in diameter. There was pain in the hypochondrium; and suppression of the menses which now took place produced congestive headach. Repeated irritations of the peritoneum were cured by local antiphlogistics. After this occurred repeated severe shiverings. This state continued with little intermission for nearly six months, when the patient had a gray wasted appearance, and became more and more feverish. Examination showed unusual enlargement of the liver and spleen. The body was distended, and there were occasionally severe asthmatic attacks, and remitting severe throbbing headach. After this profuse diarrhœa came on, attended with, on one occasion, bloody discharge. The abdomen was distended, patient exhausted, pulse weak and frequent. Fourteen days before death, a furuncle appeared in the neck, which destroyed the soft parts to the muscles. After this a general varioloid eruption appeared on the skin, resembling an exanthema

[1] Zeitschrift Wiener Aerste. 1845. II. S. 488.

[2] Schmidt—Kiwisch von Rotterau, die Krankh. d. Wochnerinnen Prag., 1840. I. 109.

which had become purulent. After this consciousness failed, and death supervened, preceded by delirium and coma.

Sectio Cadaveris.—The liver was found so enlarged, that it extended to within a little of the pubes, and, completely covering the stomach, occupied the left hypochondrium, in which region it was connected with the upper extremity of the spleen by a pseudo-membrane. The spleen extended downwards to the iliacus muscle, being also connected to the wall of the abdomen by firm adhesions. Its substance was reddish-brown, much crushed, and presented in its interior several inflamed spots. On dividing the branches of the portal vein, coagula mixed with blood escaped, without appearance of inflammation of the coats of the vessels. The vena cava ascendens contained thin fluid blood, along with purulent coagula, as also the vena portæ and the splenic vein. The pulmonary arteries contained similar clots, and the right side of the heart was filled with fluid blood and sulphur-yellow coagula, which consisted of a purulent mass, surrounded by a gelatinous layer. The left side of the heart, aorta, and thoracic duct were normal. The membranes of the brain were congested, some of the veins of the pia mater containing purulent coagula. The axillary and inguinal glands were enlarged and infiltrated with pus.

Remarks.—This case, with regard to the symptoms which occurred during life, as well as the appearances observed after death, closely resembled the undoubted instances of leucocythemia recorded in Section I. The four others had none of these symptoms, although there are facts in connection with the examination after death, especially in Case XXI., which are closely allied to the others recorded.

CASE XXIX. By Livois.[1]—Jean Michel entered the hospital of La Charité, Paris, 15th of May 1837. In 1834, being employed in digging canals at Saint Brizon, caught an intermittent fever, which returned every three days. During the interval he continued his work, so that the disease continued thirty-three months, during which period he consumed an enormous quantity of sulphate of quinine. The fever diminished only on changing his place of work. From an early period of the disease he experienced a pain in the left side, and two or three months afterwards a tumour was perceptible in the painful part. In six months the abdomen became very voluminous, and, in addition to the tumour, fluctuation was distinguished, which gave rise to the idea that a cyst had

[1] Bulletin de la Societé Anatomique, 3ième Année, p. 829.

formed. On the 26th he complained of violent colic; repeated vomiting of a greenish fluid came on, with copious diarrhœa. The dyspnœa which had previously existed was increased, and he died on the following morning.

Sectio Cadaveris six hours after death.—On opening the abdomen a large quantity of sanguinolent serum escaped. A cyst, the size of an ostrich egg, was attached to the spleen, containing a deep-red serum, mingled with a filamentous rose-coloured matter similar to fibrin. The spleen was enormously enlarged, filling the left hypochondrium, and displacing the diaphragm, stomach, and other viscera. Its weight, together with the cyst, was seven pounds. Its vertical length was thirteen, and its breadth transversely eight and a half inches. On section, it was seen to be only simply hypertrophied. The liver also simply hypertrophied, measuring transversely sixteen inches, from before backwards ten inches, and vertically four inches. The sinuses of the dura mater and cerebral veins were filled with black and liquid blood, and the cavities of the heart were filled with a similar fluid; but the right auricle contained a voluminous clot, the density and yellowish-white tint of which contrasted in a remarkable manner with the liquid condition and ash colour of the blood elsewhere. Some sanguinolent serum was found in the pleuræ. Other organs healthy.

Remarks.—Here enlargement of the spleen and liver was induced by intermittent fever. Dyspnœa and diarrhœa existed during life; and the appearance of the blood after death was peculiar, the density and yellowish-white tint of the coagula in the heart being exactly similar to what was observed in Case I.

Four other cases are recorded by Caventou,[1] Harless,[2] Andral,[3] and Bricheteau,[4] in all of which the blood after death appeared as if it were mingled with pus. Lastly, Dr Hodgkin[5] relates seven cases in which, with greater or less enlargement of the spleen, there was also hypertrophy of the absorbent glands. Although the condition of the blood in the blood vessels did not appear to have been noticed in these cases, a careful perusal of all the facts connected with them

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[1] Révue Médicale, tom. iv., p. 567.
[2] Heidelb. Annalen, 1831, bd. vii., p. 26.
[3] Clinique Médicale, ed. 4, 1839, tom. i., p. 93. Obs. xvii.
[4] L'Experience, No. 364, 1844.
[5] London Medico-Chirurgical Transactions, vol. xvii.

induces me to believe that they were closely allied to, if not identical with, those published under sections I. and II.

IV.—CASES IN WHICH THE SPLEEN WAS HYPERTROPHIED, UNCONNECTED WITH LEUCOCYTHEMIA.

Numerous cases might be given to show that leucocythemia, although often accompanied with enlarged spleen or liver, is not essentially connected with disease in those organs. Sometimes it exists without splenic enlargement, and the following cases prove that hypertrophy of the organ occurs without change in the blood.

CASE XXX.—*Hypertrophy of the Spleen; Phthisis Pulmonalis.*

Mr. C., æt. 25, clerk in a merchant's office at Glasgow, consulted me, in October 1849, for pulmonary symptoms, under which he laboured. I ascertained that phthisis pulmonalis existed in its third stage. He also directed my attention to a swelling in the left hypochondrium, which evidently depended on enlargement of the spleen, which could be felt in the abdomen extending as far forwards as the median line, and inferiorly to a level with the crest of the ilium. A few months before, he had returned from New York, where he had for some time been subject to intermittent fever. I carefully examined blood drawn from the finger of this gentleman, which presented its healthy character. He returned to Glasgow, and died of phthisis in January 1850.

CASE XXXI.—*Hypertrophy of Spleen; Cirrhosis of Liver; Ascites.*

Alexander Miller, æt. 32, a seaman, entered the clinical ward of the Royal Infirmary, November 5, 1849. He laboured under ascites, and œdema of the extremities, which he attributes to exposure to cold and wet, nine months ago, on the Mediterranean coast. The abdomen is greatly distended, measuring forty-five inches and a half in circumference, and the inferior extremities and scrotum are also much swollen from œdema. There was considerable dyspnœa, and the urine was diminished in quantity. When he lay on the right side, the spleen could be felt enlarged, but its exact limits could not be determined, on account of the ascites. He died December 29. On examination, the spleen was enlarged from simple hypertrophy, and weighed three pounds eight ounces. On section, it generally presented its normal density

and appearance; but in a few places there were spots of diffluent softening. The liver weighed four pounds, and was in the first stage of cirrhosis. Other organs healthy. The blood was examined both during life and after death, but presented nothing abnormal.

CASE XXXII.—*Hypertrophy of the Spleen.*

Daniel Cameron, æt. 21, a showman at fairs, was admitted into the clinical ward of the Royal Infirmary, July 25, 1850. The throat was very extensively ulcerated, and the spleen greatly enlarged, the swelling being of four months' standing. He was dismissed on the 23d of September, the ulcers in the throat having healed. When re-admitted on the 25th of January 1851, he says that he has had frequent attacks of diarrhœa and epistaxis. He complains of severe pain in the tumour. The abdomen appeared much swollen, and measured at its widest part thirty-three inches and a-half during expiration. Fluctuation could be felt over the inferior portion of the abdomen where the tumour did not extend. The latter was very firm, and painful on pressure, and dull on percussion over its whole surface. It presented anteriorly a well-defined margin. Superiorly this margin was felt emerging under the false ribs, and passed directly downwards about three inches to the left of the umbilicus, as far as the level of the anterior superior spinous process of the ilium. It then curved backwards, passing close to Poupart's ligament, after which it became untraceable. The whole length of the tumour from above downwards was ten inches and a half, as ascertained by percussion. His appetite was impaired, and he suffers from considerable diarrhœa, his bowels being moved in general about six times in the twenty-four hours. Pulse 70, of moderate strength. On examining his chest, percussion was found to be universally normal. On auscultation, there was increased vocal resonance and prolonged expiration under the right clavicle. Since the period of his admission he has remained in the same condition, and has been treated with astringents for the diarrhœa, and with leeches and counter-irritation for the pain in the tumour. He has also had opiate night-draughts when required. He was dismissed on the 11th of April, the tumour retaining the same dimensions, and the other symptoms continuing unaltered.

The blood was frequently examined microscopically, but was not found to contain an excess of colourless corpuscles. The coloured corpuscles were not aggregated together in rolls, but accumulated in masses, from increased spissitude of the liquor sanguinis. They were also unusually flaccid, had lost much of their elasticity, and presented a great tendency to assume a caudate or flask-like form.

Fig 11.

Fig. 11.—Blood-corpuscles altered in form, and aggregated together, in Case XXXII.

He was re-admitted July 2d. The abdomen was somewhat more enlarged; but his general symptoms, and the condition of the blood, remained the same. He left the house (August 1851). On this occasion, Dr Robertson was good enough to analyse the blood for me, with the following results:—

Spec. grav. of the blood, ...	1042·
Spec. grav. of the serum, ...	1025·5
Composition of 1000 parts :—	
Fibrin, ...	3·9
Solids of serum, ...	75·7
Globules, ...	76·3
	155·9
Water, ...	844·1
	1000·0

Remarks.—Perhaps this case is as important as any which has yet been recorded, for it indicates to us a large splenic tumour forming independent of intermittent fever, while the individual presented the cachectic aspect, the epistaxis, dyspnœa, diarrhœa, and occasional feverishness, as we have seen to occur in many marked cases of leucocythemia. And yet repeated examination of the blood exhibited no increase in the number of colourless corpuscles. It is certain, therefore, that the symptoms we have noticed are not essentially connected with the leucocythemia. We have seen them absent in many instances where the blood disease was well characterised, and present where it was slight, or, as in the case just given, altogether absent. The analysis of the blood also deserves notice, the amount of fibrin being 3·9 parts in a thousand, a quantity much beyond the limits of health, and sufficient to communicate unusual viscosity to the fluid.

CASE XXXIII.—*Hypertrophy of the Spleen.* (Communicated by Dr James Wallace of Greenock.)

John Maclachlan, mill-worker, single, Irish, æt. 22, admitted into the Glasgow Infirmary, under Dr Easton, 20th March 1850. Two years ago, in consequence, as he supposes, of having strained himself when lifting a heavy weight, the patient became affected with acute pain below the margin of the false ribs on the left side. This was relieved by cupping, but he ever afterwards perceived that there was some fulness in the affected part. He continued, however, free from uneasiness till twelve months ago, when he again became troubled with pain, followed by dropsy of the abdomen, for which he was treated in the Clyde Street Hospital, where he resided for eight weeks. From that time till five weeks ago he enjoyed a fair state of health, but he has since become once more affected with pain below the floating ribs, and also in the left renal region. Has likewise been troubled with occasional diarrhœa, accompanied with tormina and tenesmus, the stools being sometimes slimy, and tinged with blood, and the secretion of urine considerably diminished.

At present, the abdomen is very full, and fluctuation detected in the lower part when the patient is made to sit. The left hypochondrium appears fuller than the right, and there is felt a firm tumour, slightly moveable, extending over to the linea alba, and down to a line drawn transversely, and about an inch above the umbilicus. Its margins cannot well be defined by tracing it with the fingers, but percussion over the whole is dull, as well as over the lower half of the left lateral, infra-scapular, and infra-mammary regions. There is pain, on pressure, over the whole of the tumour, and also over the right hypochondrium; but the patient complains principally of pain, aggravated on pressure, in the left posterior lumbar region, in which a small firm and irregularly defined tumour can be felt. Urine exceedingly scanty, and loaded with lithate of ammonia and epithelial scales, the specific gravity being 1036; bowels loose, the stools containing some slime and blood; some tenesmus and tormina; skin of a moderate heat and dry; tongue clean and moist; pulse 88, soft.

The treatment consisted principally of diuretics, and occasional counter-irritation to the left hypochondrium, with the effect of diminishing the dropsy, but in no way checking the diarrhœa, or diminishing the emaciation, and size of the tumour. He was dismissed by desire, May 20th.

Remarks by Dr Wallace.—In this Case it is exceedingly probable, from the pain felt in the right hypochondrium, that in addition to

hypertrophy of the spleen there existed enlargement of the liver, but this could not be well ascertained in consequence of the very great accumulation of fluid in the abdominal cavity. The secretion of urine was throughout very imperfect, the quantity in twenty-four hours frequently not amounting to two ounces, and having a specific gravity as high as 1038. This might be the result partly of the diarrhœa and partly of the mechanical effect produced on the kidneys by the ascitic fluid; but I am more disposed to believe that there existed an organic affection of these organs independent of the latter cause, both because the patient, on admission, complained of severe pain in the loins, and particularly in the left renal region, where an irregular tumour was distinctly perceptible, and because, on referring to the book in which I recorded my observations on the urine, I find that it deposited, in addition to the lithate of ammonia, a large quantity of epithelial scales, which did not disappear, even after the pain abated, but continued as long as the case was under treatment. An opportunity, however, for verifying this opinion was not afforded, for the patient, who had become very weak during the last month of his residence in the hospital, was taken home by his friends, because they abhorred the idea of a post-mortem examination, which they suspected, from the interest manifested in the case, would be eagerly desired. I learned afterwards, from the nurse of the ward, that he died suddenly about a fortnight after removal, the operation of *paracentesis abdominis* having, in the interval, been performed by a surgeon in private.

Very fortunately, about a fortnight before losing sight of the patient, I abstracted, at the request of Dr Easton, a small quantity of blood from one of the veins of the forearm, and subjected it to a microscopical examination, but failed, as did also Professor Allen Thomson, to whom I took a portion of it, to discover the presence of "white cells." This is not reported in the journal, but I made at the time a private memorandum, in which, besides, I find that the blood discs were evidently diminished in amount, that the clot was exceedingly soft, and the complete separation of the serum very rapid, occupying less than an hour.

APPENDIX TO PART I.

Since the previous pages have been printed, two other cases of leucocythemia have come under my observation, which, as they furnish some very important facts to the inquiry, I shall give in this place.

CASE XXXIV.—*Leucocythemia detected during Life and after Death; no Hypertrophy of the Spleen or Liver; Enlargement, with Cancerous Infiltration of the Thyroid Body and Lymphatic Glands of the Neck; Cancer of the Lungs; Bronchitis.*

Margaret Stewart, a cook, æt. 60, admitted into the clinical ward July 16, 1851. For some years back she has been subject to a short dry cough, which has never been troublesome except after cooking a larger dinner than usual. With the exception of an attack of diarrhœa when the cholera was prevalent, she has been more or less constipated. Has never suffered from epistaxis or other form of hemorrhage. Four weeks ago she first perceived a swelling in the neck, which, commencing in front, has gradually spread towards the right side. Latterly her breathing has become short and hurried; her strength has decreased, and the cough has been accompanied by considerable expectoration. On admission, the neck presents a prominent indurated swelling anteriorly, measuring about four inches in diameter, evidently owing to enlargement of the thyroid body. A chain of enlarged glands extends from the anterior swelling round the right side of the neck, a little beyond the ear. She complains of great weakness, constant sweating at night, and cough with copious frothy expectoration. The chest is everywhere resonant on percussion. There are loud sonorous and moist râles heard over the whole chest, especially posteriorly and inferiorly. The vocal resonance is also unusually loud, but equal on both sides. The tongue is furred, dark brown in the centre, deglutition difficult, apparently from pressure of the enlarged cervical glands. The appetite is bad, with an acid taste in the mouth. Other functions properly performed. She

continued in this condition for several days, during which iodine and counter-irritants were applied to the neck, and expectorants and antispasmodics taken internally to relieve the cough. The dyspnœa, however, gradually increased; deglutition became more difficult, and her strength diminished. On the 30th of July the urine was ascertained to contain albumen, which had previously not existed. She died without a struggle, August 5th.

The day previous to her death I examined the blood with a microscope, conceiving that the enlargement of the lymphatic glands in the neck rendered this case somewhat similar to that recorded by Virchow (Case XVIII.) I found the colourless corpuscles greatly increased in number, not so numerous as in the case of Tinlay (Case II.), but fully as much so as I remember to have seen them in Case III. They were much smaller in size than those previously figured, varying in diameter from the $\frac{1}{150}$th to the $\frac{1}{100}$th of a millimetre. They presented the same re-action, on the addition of water, as in Case II.; but the divided or tripartite nucleus, like the corpuscle itself, was much smaller in size.

Fig. 12. Fig. 13.

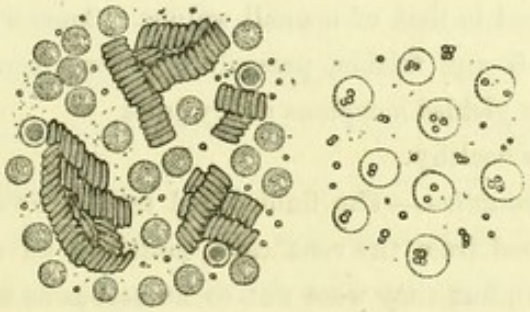

Fig. 12.—Appearance of the blood in Case XXXIV.
Fig. 13 —The same, after the addition of acetic acid.

Sectio Cadaveris, August 7.—Body greatly emaciated.

The Blood.—On carefully opening the vena portæ, the blood was found to be fluid, presenting its normal characters to the naked eye. On puncturing the vena cava descendens, the blood was of a thin gelatinous consistence, of dark red colour, approaching black. In the cavities of the heart the blood was firmly coagulated, and presented a colourless layer of the clot to half its extent, which, when torn up, was found to contain here and there masses of a cream-coloured granular material, exhibiting a marked contrast to the yellowish normal coagulum surrounding them.

Neck.—On dissecting the integuments from the neck on the right side, a considerable number of glands, about the size of a barley-corn and small pea, were observed in clusters between the platysma myoides and the sterno-mastoid

muscle. A hard tumour existed in front of the neck, stretching along the whole front of the trachea, and over the great vessels on either side beneath the sterno-mastoid muscles, and posteriorly on the right side, as far back as the transverse processes of the vertebræ, and down beneath the clavicle to the anterior surface of the first rib, where it was firmly adherent to the periosteum. A prolongation of the tumour, about the size of two walnuts, passed beneath the sternum at its upper end, being attached to its periosteum. This prolongation on section presented the outline of a congeries of enlarged lymphatic glands, having a white appearance, in some places soft, and even diffluent, and yielding on pressure a copious milky cancerous juice.

Chest.—There were lax adhesions at various points on the pleura on both sides. The pleural cavities contained a little fluid, on the right side amounting to about five ounces. At the lower part of the left lung, and also at the back part of right lung, there was a small amount of recent membranous exudation. A multitude of small cancerous nodules were scattered throughout the whole of both lungs. Some were immediately below the pleuræ, and some in the substance of the organs. For the most part these masses were scattered pretty equally, being as numerous at the base as at the apex, and varying in size from a millet seed to that of a small walnut. Some were of firm consistence, and others soft and friable, presenting various degrees of induration. They all on pressure yielded a copious milky juice.

Abdominal organs healthy.

Microscopic Examination.—The fluid blood from the vena portæ, and the more coagulated blood from the vena cava, contained an unusual number of colourless corpuscles, but they were not so numerous as was observed in the blood during life. This was explained by afterwards examining the coagula in the heart and large vessels, which contained an immense number of these bodies, aggregated together by means of molecular filaments of fibrine. The cancerous juice squeezed from the cervical glands, and the nodules scattered throughout the lungs, contained numerous cancer-cells, which it is unnecessary to describe minutely here. Associated with these were a considerable number of round colourless corpuscles, varying in diameter from the $\frac{1}{150}$th to the $\frac{1}{100}$th of a millimetre in diameter. They were globular in form, slightly granular on the surface, and no nucleus could be detected in them. (Fig. 14.) On the addition of acetic acid, however, the walls of these cells were partially dissolved, and there could now be seen a single, bipartite or tripartite nucleus, similar in appearance to what has been described in previous cases, but much smaller, the individual granules, though varying in size, not exceeding the $\frac{1}{500}$th of a millimetre in diameter. (See Fig. 15.) Further examination demonstrated that these latter bodies were not found in all the cancerous

pulmonary nodules, but only in such as accompanied the large bronchial tubes, and which, therefore, were probably originally glands.

Fig. 14. Fig. 15.

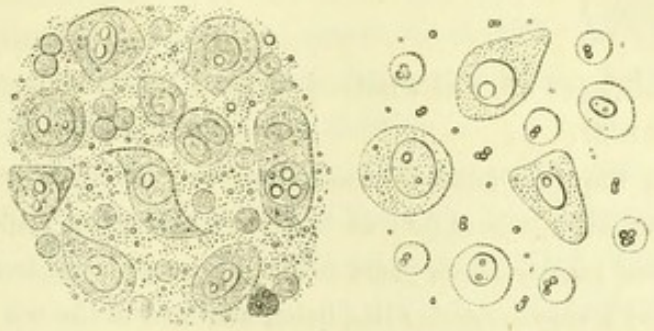

Fig. 14.—Corpuscles in cancerous juice, from thyroid body, in Case XXXIV.
Fig. 15.—The same, after the addition of acetic acid.

Remarks.—In this case there were none of the symptoms we have so frequently seen to exist in cases of leucocythemia, associated with enlargement of the abdominal organs. Remembering, however, the case of Virchow, in which the lymphatic glands only were affected, I examined the blood, and found it to contain a marked excess of colourless cell elements. These cells were much smaller than those observed in many other cases, and closely resembled those usually found in lymphatic glands. Indeed there can be little doubt that, associated with the cancer cells, were numerous cells peculiar to the lymphatic glands, a supposition that is strengthened by finding these corpuscles only in cancerous masses, which had apparently been at one time lymphatic or bronchial glands. This case also appears to me capable of throwing light upon Case XXII., recorded by Dr Fuller of London, in which there was an encephaloid tumour of the abdomen. May not some of the lymphatic glands have been involved in such a tumour, and, as in the one now before us, have given rise to admixture of cancerous matter, with the normal cells of such structures? That such an idea is more than probable, is also supported by the following case, the leucocythemia being explicable by the fact, that when cancerous infiltration takes place in a glandular structure, it frequently happens that its other component elements are more or less hypertrophied, and that the glandular cells find their way into the blood.

CASE XXXV.—*Leucocythemia detected during Life and after Death; Cancer of Liver and Lymphatic Glands; Ulcer of Stomach.*—(Communicated by Dr W. Robertson.)

James Maxwell, aged 53, was admitted to ward 5, in the Royal Infirmary, on the 22d July 1851.

History.—Till the year 1824, he worked as a field labourer in the neighbourhood of Edinburgh, where he was born, and also about Falkirk and Glasgow. For the last twenty-seven years he has been employed as a porter about Leith, and has led a very irregular life, being addicted to the use of spirits, &c. About eighteen years ago was treated in the Infirmary by Mr Syme for stricture of the urethra, which soon yielded to dilatation with bougies. Was a strong and healthy man, till within the last seven years. His present illness, the first serious one with which he was ever affected, commenced in 1845 with a lax state of the bowels, from which he has since habitually suffered. The dejections often consisted of, or were mingled with, quantities of black matter, —never, to his knowledge, with red blood. No vomiting, want of appetite, pain at stomach, œdema, or other symptom attracted his attention, till the month of May 1851. At this time he began to be annoyed with fits of vomiting, occurring at irregular intervals, — symptoms of stricture again showed themselves,—the habitual diarrhœa became more profuse,—the appetite and strength suddenly failed,—he lost flesh rapidly,—and the right testis became enlarged and painful. Soon afterwards, he began to suffer from pain in the abdomen, increased by pressure, and chiefly referred to the region of the stomach. Being unable to work, he now sought admission into the hospital.

Present Condition.—Short in stature, dark haired but nearly bald, toothless, and to all appearance nearer 70 than 53, which he states to be his real age. Is drowsy, and answers questions with difficulty and slowly, apparently from inability to sustain his attention, and from excessive feebleness. He is emaciated, particularly about the face. Skin dry, cold, and sallow. Breathes slowly. Pulse about 80 in a minute, feeble. Complains of debility, pain in abdomen, increased by pressure; fits of griping, vomiting, diarrhœa, and difficult micturition.

Abdomen feels full; the recti muscles are firmly contracted; fluctuation is perceptible in both flanks; a good deal of fluid gurgling in the bowels. The liver protrudes a full span below the right false ribs and the ensiform cartilage. Its surface can be felt, hard, and covered with irregular nodules of various sizes, some of which are impressed with, or include, cup-like depressions of

smaller size. These nodules may be distinctly felt descending with the substance of the liver during inspiration. The spleen does not seem to transgress its normal limits. The superficial veins in the epigastrium are distended. The pulsation of the abdominal aorta is obscurely communicated to the swollen liver. The bladder, on percussion, seems full of fluid. The right tunica vaginalis is occupied with a tumour, part fluid, part solid. Urine not examined, being passed at stool, and in small quantities.

August 9.—Bougies have been several times passed, and the stricture admitted number 6 a day or two ago. The urine is now passed more easily ; it is scanty, of a light straw colour, specific gravity 1015, slightly turbid when heated. On the addition of nitric acid, a blackish precipitation takes place,—redissolved by the addition of more acid, and passing through dark olive green and purple to a light reddish tinge, in which albuminous flocculi remain suspended.

The treatment has been palliative, consisting of diuretics, including gin, aqua potassæ, sp. æther, nitrici, and tincture of hyosciamus. Gallic acid and opium have been used to mitigate the diarrhœa ; and wine has been given in moderate quantities.

Vomiting of dark-coloured matters, and purging of dark fæces, mixed with blood, have of late been very urgent. The strength has greatly declined, and the emaciation made progress, while œdema of the lower extremities has come on. The tumour in the right side of the scrotum now exceeds in size a large turkey's-egg. A drop of blood examined to-day microscopically, was seen to contain an unusual proportion of colourless corpuscles, irregular in size, and, for the most part, not larger than the red corpuscles. Died August 11.

Sectio Cadaveris, August 12.—*Chest.*—Left sac of pleura contained about 4 oz. of clear serum. Left lung slightly adherent. Less fluid in right pleura, and a few adhesions posteriorly. Both lungs slightly œdematous ; a few stripes or cicatrices at each apex. Bronchial tubes contain much frothy mucus; mucous membrane much congested. Heart contains coagula of yellowish-white colour, and dark fluid blood, in all its cavities. It weighs 8 oz.

Abdomen.—About two pints of serum in peritoneal cavity ; for the most part clear, but in the pelvis turbid and mixed with soft strings and flakes of lymph. Lower margin of *liver* extending from the cartilage of ninth rib on either side, straight across the epigastrium. Surface of liver thickly studded with yellow-tubera, in size varying between that of a walnut and pea ; adherent to the stomach, and, when separated, disclosing a large black, fœtid, ulcerated aperture into the cavity of this viscus. Liver weighs 5 lbs. 12 oz. On section, the

usual characters of encephaloid disease are apparent, and some of the tubera are found to be as large as a hen's-egg.

Two perforating ulcers existed,—one in the anterior, and the other in the posterior wall of the stomach, both nearer the cardiac than the pyloric extremity, opposite each other, and about an inch in diameter. Both were closed up by adhering peritoneum, and their edges were thickened, sloughy, greenish, and fœtid.

The *spleen* measures nearly 5 inches by 3½ inches, and weighs 15½ oz. It is adherent to diaphragm, and to the great end of the stomach; and, when separated, discloses another ulcerated performation of considerable size. Surface of spleen at different parts white and semi-cartilaginous; its substance firm, and on section normal.

Kidneys weighed 10 oz.; pancreas 2½ oz. The mesenteric and lumbar glands hypertrophied, and some of them cancerous.

The great vessels, especially in the lumbar region, surrounded and compressed by enlarged glands.

Bladder empty. A short and narrow stricture of the urethra about four inches from the external meatus.

Hydrocele of right tunica vaginalis. Right testis enlarged.

Mucous membrane of small intestine congested, except about Peyer's glands, which are pale and shrunk. Membrane generally firmer than usual. In colour throughout minutely granular, irregularly thickened, and of dark scarlet colour.

Fat of omentum peculiarly granular, and appendices epiploicæ firmer than usual.

The blood was taken carefully from the vena portæ and vena cava descendens. The first presented a thickish fluid of a dark colour; the last was formed into soft gelatinous clots. The blood was firmly coagulated in all the cavities of the heart, the coagula extending into the large vessels. They presented a dark and yellowish layer; the last exhibited, for the most part, a semi-transparent fibrous appearance, but towards its upper portion the clot was opaque, of dirty yellow, and readily broke down under pressure, yielding a copious purulent-looking fluid. This difference in various parts of the colourless coagulum was easily detected by difference both of colour and general consistence.

Microscopic Examination by the Author.—During the life of this individual I was enabled, by the kindness of Dr Robertson, to examine blood, taken from her finger by the prick of a pin, several times. The colourless corpuscles, which were much increased in number, presented two distinct sizes. The larger were evidently the ordinary colourless bodies, such as are seen in health, and were observed in most of the other cases we have recorded. They ap-

peared to be in their normal proportion to the coloured corpuscles, and when acted on by acetic acid exhibited the usual double or tripartite nucleus. The smaller colourless bodies, which were much more numerous, varied somewhat in size, but were of the average diameter of $\frac{1}{200}$th of a millimetre. They were round, had a finely granular surface, and, on the addition of acetic acid, underwent no change in size, but their external margin became more distinct, and the whole corpuscle somewhat more transparent. (Figs. 16 and 17.)

Fig. 16. Fig. 17.

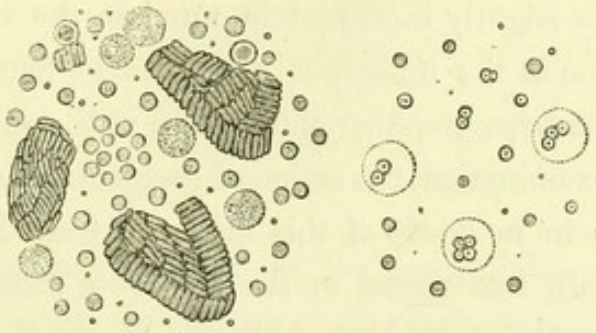

Fig. 16.—Appearance of blood in Case XXXV.
Fig. 17.—The same, after the addition of acetic acid.

On examining the portal blood after death, it was found to be crowded with colourless corpuscles of the two distinct sizes formerly noticed. That from the vena cava contained also more than usual, but by no means so many as were present in the portal blood. The colourless coagula from the heart presented, for the most part, its normal fibrous structure; but its upper fourth, where it was softer and readily broke down, was almost wholly composed of the colourless bodies formerly described.

The cancerous masses in the liver yielded a copious milky juice, which contained numerous cancer cells. These, in the smaller nodules, were of young formation, while in the larger ones they were more or less loaded with fatty granules. Masses of reticulum were also present in these larger nodules, consisting of fatty molecules and granules, with disintegrated cells and nuclei. Very few of the colourless corpuscles were found in the cancerous juice from the liver, and these apparently were divided from the blood.

The white cancerous-looking lymphatic glands contained numerous cancer cells; but there was associated with them a multitude of naked nuclei, and a few cells peculiar to the gland. These last, on being acted on by acetic acid, presented a round nucleus, which, both as to size and structure, exactly resembled those previously observed in the blood. In some lymphatic glands the cancer cells were few in number, and in others altogether absent; but these

latter were enlarged, yielded a turbid gray juice on pressure, and contained a multitude of the colourless bodies just alluded to.

The spleen pulp was composed almost wholly of colourless bodies, exactly the same as those found in the lymphatic glands and in the blood, mixed with a few blood globules, and the usual fusiform cells of which the trabeculæ are composed.

Remarks.—In this case the colourless corpuscles in the blood were of two distinct sizes. The larger were the usual bodies found in the blood, very slightly increased in number, the smaller were evidently the same as the numerous naked nuclei found in such large numbers in the hypertrophied glands, and in the spleen pulp. The most careful examination, the action of re-agents, and exact measurement, left me in no doubt of this fact. In Case XVIII. Virchow speaks of certain free nuclei in the blood,—a statement which has always appeared inconsistent with my observations until I met with the present case; but which is now fully confirmed. On examining the larger colourless bodies after the action of acetic acid upon them, there might be detected evident transitional changes between the single nucleus exactly like those which were naked, and the double tripartite, and even quadruple body, so frequently presented. This case, therefore, in conjunction with the last one, demonstrates, that hypertrophy of the lymphatic glands causes increase of its cell or nuclear element, and that these find their way into the blood. It is also deserving of notice, that the spleen in this case was only a very little enlarged, though soft, and abounding in corpuscles. The importance of these facts will be dwelt upon in the Second Part of this Memoir.

PART II.

I HAVE now collected together all the cases which are known to me, in which an excess of colourless corpuscles has been observed in the blood. These serve to establish the occasional existence of a morbid condition, eminently calculated to arrest the attention of the physiologist and pathologist. That the blood may be loaded with a multitude of cells, exactly resembling those of pus; that such blood may circulate in the human subject for months, or even years, without destruction to life, and that this condition is always associated with disease in those organs, the functions of which have hitherto been involved in the greatest obscurity, constitute facts which seem calculated to exercise an important influence on many views that have been long agitated in science. The constitution of the blood itself; the origin of its morphological elements and chemical proximate principles; the importance of the lymphatic system; the functions of the spleen and other blood glands; the nature of purulent infection, and other diseases of the blood, may be expected to be more or less elucidated by a study of the accompanying phenomena, causes, and results, of leucocythemia. With a view, then, of stating as succinctly as possible the conclusions which may be legitimately derived from the thirty-five cases previously recorded, I shall divide this part of the inquiry into several sections, in which all these important topics will be shortly considered.

SECTION I.

SYMPTOMS OBSERVED IN INDIVIDUALS AFFECTED WITH LEUCOCYTHEMIA.

The symptoms have been very carefully observed in several of the cases recorded in the first part of this Memoir, but we have great difficulty in referring any of them to the mere alteration in the blood. Several of those which were most constant and best marked in advanced cases, were apparently caused by the increased size of the spleen or liver, as they have been seen to occur in other cases where these organs have been enlarged, without the occurrence of leucocythemia (Case XXXII). No doubt the peculiar change in the blood of which we are treating has been discovered in individuals affected with enlarged spleen; but this may arise from the circumstance, that the circulating fluid has been more frequently examined in persons labouring under that complication. When leucocythemia, however, is more generally studied, it will very probably be found associated with enlargement in other organs, especially of the thyroid, thymus, supra-renal capsules, and lymphatic glands. Hence, I am persuaded, no systematic history of the symptoms connected with this morbid state can be given in the present state of our knowledge; and I shall therefore merely content myself with an analysis of those observed in the cases recorded.

Of the 35 cases which are given in the preceding pages, leucocythemia was demonstrated to exist, by careful microscopic examination, in 25. The facts presented by these may be afterwards compared with those offered by such cases as were doubtful, or by those in which, associated with enlarged spleen, it was proved that the blood was quite healthy.

Sex.—Of the 25 cases, 16 occurred in males and 9 in females.

Age.—The youngest case in which leucocythemia was observed was in a girl aged 9, and the oldest in a woman aged 69 years. In

two cases the ages are not stated, but in the remaining twenty-three they may be arranged as follow :—Under 10 years, one case ; between 10 and 20, two cases ; between 20 and 30, three cases ; between 30 and 40, seven cases ; between 40 and 50, four cases ; between 50 and 60, three cases ; and between 60 and 70, three cases. So far as this analysis goes, the disease would appear to be most common in adult life, and more frequent in advanced age than in youth.

Abdominal swelling.—Greater or less swelling of the abdomen was present in twenty out of the twenty-five cases,—evidently dependent, in the majority of these, on enlargement of the spleen and liver, singly or united. In five cases ascites was also present. In several of the cases there was more or less abdominal pain or tenderness, while in a few the enlargement only produced inconvenience from its size or weight.

Respiration.—The respiration was more or less affected in twelve out of the twenty-five cases. Of these dyspnœa existed in eight. The respiration is said to have been hurried in one ; short in a second ; laborious in a third ; and slow in a fourth. The disordered respiration appeared to be dependent in some cases on enlargement of the abdomen, and corresponding compression of the pulmonary organs, in others (five cases) it may have resulted from disease of the lungs themselves.

Vomiting was present in seven cases. In two at the commencement, in three it was occasional, in one there was hematemesis, and in one it was connected with ulcer of the stomach.

Diarrhœa was present in twelve cases, and in some was the leading symptom throughout the progress of the disease. In Tinlay, for instance (Case II.), during the six months he was in the Infirmary, the bowels were opened from eight to twelve times a-day for weeks together. In other cases this symptom only came on latterly, and in a few was not urgent.

Constipation is said to have existed in five cases.

Hemorrhages.—Extravasation of blood occurred in fourteen out of the twenty-five cases. Of these there was epistaxis in six cases ;

hematemesis in one case; hemorrhage by stool in four cases, including two cases of hemorrhoids; hemoptysis in one case; flooding after delivery in one case; and bleeding from spongy gums in one case. In some of these cases bleeding from the gums or bowels was associated with epistaxis, and this last symptom was observed in some of the best marked cases of the disease, with enlarged spleen.

Dropsy was present, more or less, in thirteen cases, generally dependent on the abdominal tumour. There was anasarca in two cases, ascites in four cases, and œdema of the lower extremities in seven cases.

Fever.—More or less fever was observed in eleven cases, indicated by increase of pulse, loss of appetite, thirst, and heat of skin. It was occasionally present at the commencement, at other times at the termination, of the disease. In no case did it exist to any extent, or was long continued. From the frequency of splenic enlargement, it might be supposed by some that the disease was connected with intermittent fever, but that this ever occurred is very doubtful. It is said to have preceded the disease in three cases. In Case VIII. the report says, that four months previous to admission there had been intermittent fever; but Dr Walshe adds, "this point was not sufficiently inquired into." In Case X. there had been repeated attacks of ague, the last of which occurred nine years before he came under observation, and seven years before the abdominal tumour was perceived. In Case XIX. the patient also had laboured under intermittent fever, but seventeen years previous to the commencement of the abdominal swelling. So far as the recorded cases are concerned, therefore, there is every reason to believe that intermittent fever is in no way concerned with the production of leucocythemia.

Palor of the surface.—An unusual palor of the surface was observed in many cases, resembling that of anemia. The conjunctivæ, also, were of a peculiar light blue tint.

Jaundice.—In one case only of all those in which the liver was affected, was jaundice observed.

Emaciation.—In most of the fatal cases, emaciation was extreme.

Complications.—Disease of the lung was present in five cases, in-

cluding one case of bronchitis, one of phthisis, and three of pneumonia. Bright's disease existed in two cases,—cerebral hemorrhage in one case; cancer was present in three cases,—in one, in the form of an undescribed abdominal tumour (Case XXII.); in a second, there was cancer of the thyroid body and neighbouring lymphatics; and in a third, cancer of the liver, with ulcer of the stomach, stricture of the urethra, and hydrocele. All these diseases were characterised by their peculiar symptoms, or physical signs, during life.

It must not be supposed that the above numerical account of the symptoms exhibits even an approximation to the proportion which any particular one holds to the number of cases on record. Owing to the imperfection with which many of these are described, important symptoms in some not being even alluded to, this is obviously impossible. Statistics are no more applicable to this subject than to any other in medicine, where the cases have not been expressly drawn up in reference to such an inquiry.

SECTION II.

CONDITION OF THE BLOOD IN CASES OF LEUCOCYTHEMIA.

Of the twenty-five cases of undoubted leucocythemia, it was detected after death only, in ten; during life only, in six; and both during life and after death, in nine cases. Thus, it has been detected in the living body in fifteen cases, and in the dead body in nineteen cases.

On examining the blood of living persons (which is most readily accomplished by extracting a drop from the finger by pricking it with a needle, and then examining it between glasses under the microscope in the usual way), the yellow and colourless corpuscles are at first seen rolling confusedly together, and the excess in number of the latter is at once perceived. This, however, becomes more evident after a short time, when the coloured bodies are aggregated together in rolls, and leave clear spaces between them, which are

more or less crowded with the colourless ones. Means are altogether wanting to enable us to determine with exactitude the relative proportion of the two kinds of corpuscles in different cases. In some the colourless corpuscles are only slightly increased beyond their usual number. In one case they are described as five times as numerous as those in health. They are also said in particular instances to be "greatly increased," "one third as numerous," and "as numerous" as the coloured corpuscles. In all these statements there is nothing exact. Perhaps the best method of judging, is to regard the spaces or meshes left between the rolls or aggregations of yellow blood corpuscles. When these are completely filled up, the colourless bodies do not, in fact, amount to one-third of the coloured ones, on account of the large number of the latter which may exist in a small space, in the form of rouleaus. This will appear from counting them in Fig. 6, p. 14.

The size of the colourless corpuscles in the various cases given, differs considerably. Even when at first sight they appear to be of tolerably uniform size in any one case, it may be observed, when they are magnified highly and carefully measured, that some are twice the size of others, with all the intervening sizes between them. In some cases, though comparatively few in number, they are described as being three or four times larger than the coloured corpuscles, and in two cases (Cases XXXIV. and XXXV.) they were in one about the same size, or somewhat smaller, and in the other of two sizes, one larger and the other decidedly smaller.

In the nineteen cases in which the blood was carefully examined after death, the same variations with regard to number and size of the colourless corpuscles were found to exist, as have just been referred to in blood drawn fresh from the finger. It was always observable, however, that they were most numerous in the clot; and when they existed in any number, as in Cases I. and II., they communicated to the colourless coagulum a peculiar dull, whitish look, and rendered it more friable under pressure (Case I.). When less numerous, portions of the colourless coagulum from the heart and large vessels might be seen to present a dull cream colour, easily distinguishable

from the gelatinous and fibrous appearance of a healthy clot, and such altered portions always contained a large number of the colourless bodies. This was especially observable in Case XXXV.

There is one remarkable fact which has been strongly impressed upon me by careful observation of the preceding cases. In no one instance has the condition of the blood been observed to undergo any marked change after the excess of white cells in it was discovered. In no case has this condition of the blood been seen to appear and progress gradually, as is observed in so many other lesions. In the case of Tinlay (Case II.), the patient was under medical observation for a period of eighteen months, and the same excess of colourless corpuscles existed at the end of that time as at its commencement. In the case of Kerr (Case XV.), the corpuscles were only slightly augmented in number, and yet at the end of eleven months they were not more numerous than when first examined. Cases are still to be met with, therefore, in which the commencement and progress of leucocythemia are to be observed. Such can only be expected to be found when the microscopical investigation of the blood is more generally practised in clinical investigation, as it is commencing to be in the Royal Infirmary. (See Case XXXVI., p. 128.)

SECTION III.

CHEMICAL COMPOSITION OF THE BLOOD IN CASES OF LEUCOCYTHEMIA.

The chemical analysis of white cell-blood has been undertaken on nine occasions, a number far too few to arrive at any important results. One cause of this is, that in the majority of the undoubted cases the morbid condition of the blood was only discovered after death, when any analysis of it in reference to the relative proportions of all its constituents cannot be determined with certainty. Another cause is owing to the circumstance, that several of the cases observed during life were so weak and exhausted, that the abstraction of even two

oz. of blood, for the purpose of analysis, could not be safely ventured upon. Of the nine analyses, six were performed by Dr William Robertson of Edinburgh, one by Mr Drummond (Case XIV.), one by Dr Parkes of London (Case XX.), and one by Dr Strecker of Giessen (Case XXIII.). The following is a tabular view of these analyses:—

Analyses of the Blood.

Case.	Sp. Gr. of Blood.	Sp. Gr. of Serum.	Fibrin.	Serous Solids.	Globules.	Total Solids.	Water.	
II.	1041·5	1026·5	6·0	72·0	67·5	145·5	854·5	Leucocythemia.
III.	1036·0	1023·0	2·3	67·0	49·7	119·0	881·0	
XIV.			2·43	93·20	100·75	196·47	801·32	
XV.	1049·5	1029·0	5·0	95·0	80·0	180 0	820·0	
XX.			7·08	75·22	101·63	183·93	816·07	
Later Analysis			4·75	77·52	97·93	180·2	819·8	
XXIII.			4·46	82·35	97·39	184·2	815·8	
*XXXVI.	1043·5	1027·0	3·2	80·7	82·3	166.2	833·8	
XXXVII.	1044·0		4·2					

From these data, Dr W. Robertson has been kind enough to contrast Lecanu's standard of the average composition of healthy blood, with the calculated mean of all the known observations made on the blood of leucocythemia, in the following table:—

Proportions in 1000 parts Blood.	In Health.	In Leucocythemia.
Spec. Grav. of Blood, ...	1052	1043
Spec. Grav. of Serum,.....	1029	1026·4
Total Solids : Water, ...	As 1 : 3·762	As 1 : 4·9
Serous Solids : Water, ...	1 : 9·675	1 : 10·33
Serous Solids : Total Solids,	1 : 2·625	1 : 2·11
Globules : Total Water, ...	1 : 6·220	1 : 9·81
Globules : Total Solids,.....	1 : 1·653	1 : 2·0
Globules : Serous Solids, ...	1 : ·630	1 : ·949
Fibrin : Water, ...	1 : 263·00	1 : 189·6
Fibrin : Total Solids,.....	1 : 70·00	1 : 38·7
Fibrin : Serous Solids, ...	1 : 26·66	1 : 18·35
Fibrin : Globules, ...	1 : 42·33	1 : 19·35

From these results it would appear that the chemical constitution

* These cases will be found in the Appendix of Part II., but I have thought it best to put all the chemical results together in this place.

of the blood in cases of leucocythemia, consists in an excess of the fibrin and diminution of the corpuscles, while the serous solids undergo little if any diminution. In seven out of the nine analyses, the fibrin exceeded the normal amount. Of the two exceptional cases, in one (Case III.) there was purpura hemorrhagica, a disease characterised by Becquerel and Rodier, as being deficient in fibrin. In this instance, however, the fibrin amounted to 2·3 parts in a hundred, a quantity which may be considered high in a case of purpura. In the other case (Case XIV.), the blood was obtained, after death, from the heart and veins, instead of from the living subject, as in Dr Robertson's analyses. In the other seven analyses, the fibrin varied from 3·2 to 7·08 parts in a thousand.

In all the analyses, the blood corpuscles were under the normal standard. In Case III., affected with purpura hemorrhagica, they were so low as 49·7, and in Case XX., the highest in the table, they only amounted to 101·63 in the thousand parts. The table indicates that no relation can be detected between the excess of fibrin and the diminution of corpuscles. In Case II. the fibrin amounted to 6, and the globules to 67·5, and in Case XX. the fibrin was 7·08, and the globules 101·63 in a thousand parts.

The clot has been analysed in two cases, in one (Case II.) by Mr Drummond, in the other (Case XXVI.) by Bessière. The results were very different.

Analyses of the Clot.

Case II.—Water,	- - - -	745·8
Total Solids,	- - -	254·2
		1000.0
Fibrin,	- - - -	7·39
Fatty Matter,	- - -	1·43
Fixed Salts,	- - -	8·21
Case XXVI.—Water,	- - -	857·7
Albumen,	- - -	83·7
Fibrin,	- - -	22·1
Fat and Extractive Matter,	-	2·1
Loss,	- - -	5·0
		1000·0

With regard to the iron in the blood, its amount has been determined in two cases, one by Dr Strecker (Case XXIII.), the other by Mr Drummond. (Case II.) The former found in 100 parts of the ashes 3·42 of oxide of iron, the latter 2·06.

SECTION IV.

MORBID ANATOMY OF INDIVIDUALS AFFECTED WITH LEUCOCYTHEMIA.

Of the twenty-five undoubted cases of leucocythemia which have been recorded, the body has been examined after death in nineteen. The information obtained from this source may be still further extended by a consideration of four cases in which the existence of this condition of the blood is highly probable; of seven cases recorded by Dr Hodgkin of enlargement of the spleen and lymphatic glands, and of two cases examined after death where the spleen was hypertrophied without leucocythemia. In all, thirty-two dissections.

The organs which have been found to be most uniformly diseased are the spleen, the liver, and lymphatic glands, and of these I shall speak separately. The other lesions found in the brain, lungs, heart, kidneys, &c., alluded to in Section I., under the head of Complications, were evidently accidental or consecutive, and need not be specially considered in this place.

Condition of the Spleen.—Of the nineteen cases of leucocythemia in which the body was examined after death, the spleen was found to be more or less enlarged in sixteen. In the other three, although it was healthy, the pulp in one is said to be "a little more compact than usual;" in a second its condition after death is not alluded to, although an encephaloid tumour occupied the left side of the abdomen; and in a third, the spleen was "healthy."

Of the sixteen cases in which the spleen was increased in volume, it weighed above 9 lbs. in three; above 5 lbs. in two; above 3 lbs. in two; above 2 lbs. in four; and nearly 1 lb. in one case. In four cases it was not weighed. The greatest weight of a spleen was 7 lbs. 13 oz., and the largest measurement 16½ inches long, and 9½ inches broad. The texture of the organ varied in different cases, in some being of unusual density, in others natural, and in a third class more or less soft and pulpy. In a few cases it contained yellowish masses, apparently a form of deposit, but in reality degenerated tissue. The structure was examined microscopically in seven cases, in all of which it was demonstrated that the cell and nuclear elements were increased, while the fibrous portion of the organ was apparently normal.

In four cases in which the existence of leucocythemia is probable, changes similar to those just stated occured in the spleen, and in Dr Hodgkin's cases similar lesions were found associated with enlarged lymphatic glands.

It is clear, however, that mere enlargement of the spleen is not necessarily connected with white cell-blood, for in case XXXI. it was simply hypertrophied, and weighed three pounds and a half; and in numerous other cases, where this organ has been undoubtedly enlarged, it has been proved by careful examination, that the blood was normal. (Cases XXX., XXXI., XXXII., and XXXIII.) From the observations I have made on the structural differences in the spleen under these two circumstances, it appears to me that when enlarged in leucocythemia, its corpuscular elements are proportionally increased in number. When enlarged in other cases, it is apparently owing to simple hypertrophy, increase of the fibrous element, or congestion of blood. All these various alterations may be mingled more or less together, in different ways and degrees.

Condition of the Liver.—Of the nineteen cases examined after death, the liver was diseased in thirteen. In the other six, it is distinctly stated to have been healthy in five, while in one it is not noticed in the report.

Of the thirteen cases, the liver was cirrhosed in two,—one in its incipient and one in the advanced stage of that disease. In a third case there was cancer of the organ, and in the ten others the liver was more or less hypertrophied. Of these, it weighed above 13 lbs. in one; above 12 lbs. in one; above 10 lbs. in one; above 6 lbs. in three; and above 5 lbs. in two cases. In two cases, though much enlarged, the weight is not stated. In these cases the organ was more or less congested, and its consistence varied from great firmness to a degree of softening amounting to diffluence. The minute structure of the liver was carefully examined in four cases; and found to be unaffected in three, while in the fourth it was infiltrated with cancerous exudation.

In the six probable cases of leucocythemia, it is said that the liver was greatly hypertrophied in four. In the other two, its condition is not stated.

Condition of the Lymphatic Glands.—Of the nineteen cases examined after death, the lymphatic glands were more or less diseased in eleven. Indeed, it is very probable that they were affected in a larger number, as in most of the other cases they were in no way alluded to, and may possibly have escaped observation from an unacquaintance with the importance which, as we shall see, ought to to be attached to them.

Of the eleven cases, the lymphatic glands throughout the body were greatly enlarged in four, and more or less cancerous in three others. The mesenteric glands were especially affected in two; the thyroid and epigastric glands in one; and the solitary and aggregate intestinal glands in one. In some cases they were soft, presenting on section a granular whitish appearance, and yielding a copious turbid juice on pressure. In other cases they were more indurated; and in one there were slight calcareous deposits. The glandular structure was carefully examined microscopically in eight cases, and in all exhibited increase of the normal tissue, the juice abounding in cell or nuclear elements. In two cases, cancer cells were mingled with the healthy textures of the glands.

In the 17th volume of the Medico-Chirurgical Transactions, Dr Hodgkin has recorded seven cases in which the lymphatic glands were more or less enlarged, and at the same time associated with increased size of the spleen. He considers the enlargement of both structures to be allied, and to depend upon a primary lesion unconnected with inflammation or adventitious structures. The appearance of a bloody serum in the thoracic duct and absorbents struck him in two of these cases, but the blood itself was not apparently noticed. At the time Dr Hodgkin wrote (1832), the microscope was not much employed in pathological investigation; but had the blood been examined in these cases, I cannot resist the conviction that the discovery of leucocythemia would not have been reserved for the year 1845.

SECTION V.

RELATION EXISTING BETWEEN THE COLOURLESS AND COLOURED CORPUSCLES OF THE BLOOD.

Many physiologists have maintained that the coloured corpuscles are formed from the colourless ones; and among those who hold this opinion, some have supposed that the latter bodies are directly transformed into the former (Paget);[1] whilst others contend, that, whilst such may be the case in fishes, reptiles, and birds, in mammals the coloured disc is merely the liberated nucleus of the colourless cell (Wharton Jones).[2] From the observations I have made on the blood corpuscles in cases of leucocythemia, the latter appears to me to be the correct opinion.

The mode of transformation of the nucleus of the colourless cell into the flattened, bi-concave, coloured disc has not yet been described; but, from the appearances I have observed, it would seem

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[1] Kirke's Physiology, pp. 68, 69.

[2] Lond. Phil. Trans., 1846.

to take place in the following manner:—The colourless cell may frequently be seen, on the addition of acetic acid, to have a single round nucleus. But more commonly the nucleus is divided into two, each half having a distinct depression, presenting a shadowed spot in its centre. Occasionally, before the division takes place, the nucleus becomes oval, and sometimes is elongated, more or less bent, and even of a horse-shoe form. Not unfrequently the nucleus is divided into three or four granules, each having the central shadowed spot. All the appearances here figured have been frequently observed, although I have placed them in the presumed order of development.

Fig. 18.

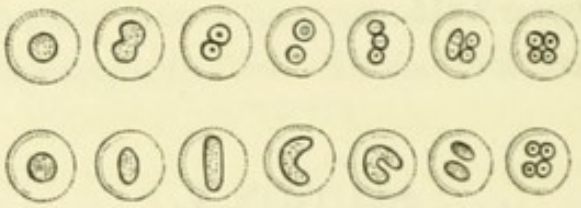

Fig. 18.—Colourless blood-cells observed in leucocythemia, showing the different appearances of the nuclei, placed in the presumed order of their development. 500 diam. linear.

On one occasion the colourless bodies in the blood were of two distinct sizes. The smaller were evidently free nuclei, such as could be observed within the larger. (See Figs. 16 and 17, p. 81). On examining these latter, after the addition of acetic acid, all the appearances represented in the accompanying figure were observable, which I have again placed in the presumed order of development. On

a *b* Fig. 19.

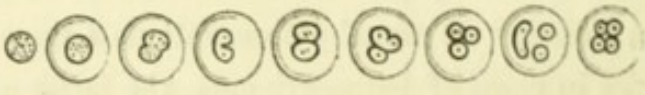

Fig. 2.—Development of the nucleus in colourless blood-cells, in another case of leucocythemia.

examining the lymphatic glands in this case, they were observed to contain the first body figured (*a*) in great numbers, associated with a few of the second one (*b*).

On several occasions the blood, when crowded with colourless corpuscles, was removed from the arm by venesection; and it was observed, that after standing twenty-four hours these variously-shaped

nuclei had become of a straw colour, and exactly resembled the coloured discs in tint. It was immediately apparent that they had imbibed the colouring matter of the blood, leaving the cell which surrounded them perfectly transparent. (See Fig. 8, p. 14.)

With a view of still further determining the transitional changes in the colourless cells, I performed the following experiment:—A rabbit was killed, three hours after having eaten a meal. The thorax was rapidly opened, and a ligature placed round the pulmonary artery, to prevent the corpuscles coming from the thoracic duct passing into the lungs. The abdomen was then pressed gently for a few moments, to favour the flow of chyle, and then a ligature placed round the large vessels, and the heart removed by cutting above it. On examining the blood in the right ventricle, it presented an unusually large number of colourless cells, the nuclei of which, on the addition of acetic acid, exhibited all the transition stages figured. (Fig. 19.) On examining the blood in the left ventricle, the colourless cells were normal in amount. This experiment was repeated with the same results.

I am therefore of opinion, with Valentin, Wharton Jones, and others, that the coloured blood corpuscles in mammals are free nuclei. But I do not consider, with the latter observer, that these nuclei in mammals should necessarily proceed so far in development as to be surrounded with a cell wall,—in other words, the coloured disc is not always a further phase in the evolution of the colourless cell. On the contrary, I believe that the vast majority of the coloured blood discs simply reach the nuclear stage of growth before they join the circulation. Many of them, however, *do* proceed beyond this point in development, and may be seen to have cell walls around them. Under such circumstances, the nuclei increase endogenously by a process of fissiparous division, in the manner formerly described, circulate in the blood within colourless cells, and on the solution of the cell wall, also become coloured blood discs.

I have further examined the blood of birds, reptiles, and fishes, and have been enabled to observe transitional forms between the

colourless and coloured cell, with even greater facility than I could in man. Indeed, the attention once directed to this point, scarcely a demonstration of blood can be made in these animals without seeing abundant evidence that the latter is a transformation from the former. In them, however, the colourless cell, at first round, enlarges gradually, becoming oval, and colour is added to it. Thus—

Fig. 20.

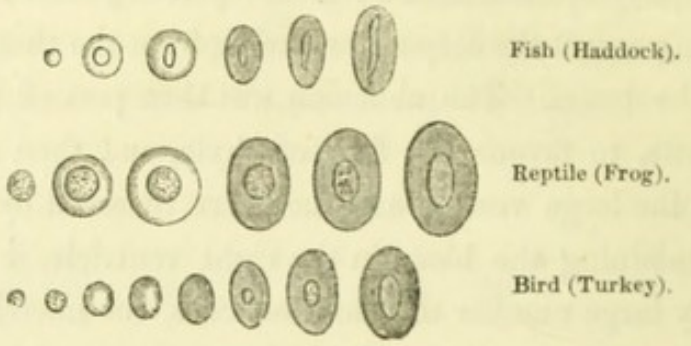

Fig. 20.—Cells of various sizes, colourless and coloured, observed in the blood of a haddock, frog, and turkey, placed in the order of their supposed development. The three first bodies figured in each line are colourless. 450 diam. linear.

The nuclei also, after the addition of acetic acid, may be observed in these animals to be undergoing fissiparous multiplication within the cells. Thus the following appearances may readily be seen :—

Fig. 21.

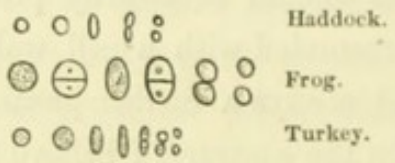

Fig. 21.—The nuclei of the blood cells of the haddock, frog, and turkey, as seen after the addition of acetic acid.

Hence the same mode of endogenous development may take place in the blood cells of all the vertebrated tribes of animals, the difference being, that whilst in birds, reptiles, and fishes, the corpuscles retain the form of nucleated cells, in mammals we find the majority of them to be free nuclei.

SECTION VI.

ORIGIN OF THE BLOOD CORPUSCLES.

Hewson was the first who distinctly stated, that the blood-corpuscles were derived from the lymphatic glands, yet few have adopted his opinions. Even Cruickshank, who wrote on the lymphatic system immediately after him, and was one of his contemporaries, says of the lymphatic fluid in which these corpuscles swim, "that we do not know the use of this fluid." [1] The correctness of Hewson's views is not even clearly admitted by his recent commentator, Mr Gulliver,[2] has been denied by most physiologists in this country, and although Nasse, Wagner, Müller, and a few others, have contended that the lymph corpuscles in the blood are the same as those found in the lymphatic vessels, the mode of their origin and their functional importance is not even alluded to.

On examining the chyle in the lacteals ramifying below the serous coat of the intestine, it is found to consist of a multitude of minute fatty molecules, floating in a fluid. These diminish in number as the chyle progresses towards the thoracic duct, where it is found to contain a number of free nuclei, mingled with a few

a Fig. 22. b

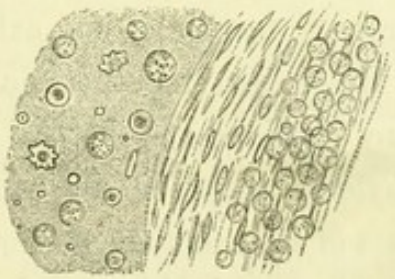

Fig. 22.—*a*, fluid; *b*, coagulated chyle, taken from the thoracic duct of a dog, three hours after being fed. In the fluid portion are seen the corpuscles of the various forms alluded to, surrounded by a multitude of molecules constituting the "molecular basis" of the chyle described by Gulliver. In the solid portion are seen the corpuscles, imbedded in fibrillated fibrin, round in the centre, but more or less compressed and elongated towards the margin.

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[1] The Anatomy of the Absorbing vessels of the Human Body. London, 4to, 1786. P. 73.

[2] The Works of William Hewson, F.R.S., edited by George Gulliver, F.R.S.L. Printed for the Sydenham Society. Note, p. 281.

others which are surrounded by a delicate cell wall. The free nuclei may frequently be observed in mammals to present the same size and bi-concave discoid form of the coloured blood corpuscles. (Fig. 22, *a*.) Moreover, on the addition of water, they in like manner become globular, and, after the fluid has been allowed to evaporate a little, assume a puckered or crenated appearance. They only differ in their want of colour, and in not being partially soluble on the addition of acetic acid. (Figs. 22, *a*; 23, and 24.) On cutting into a well-formed lymphatic gland, and examining the juice which may be squeezed from it, it will be found to contain numerous free nuclei and nucleated cells. These are evidently the same

Fig. 23. Fig. 24.

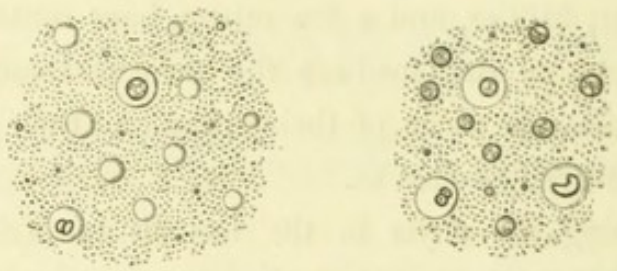

Fig. 23.—Fluid chyle, mingled with water, taken from the thoracic duct of a cat, three hours after it had been fed on milk.
Fig. 24.—The same, after the addition of acetic acid.

bodies as are found in the lymph and chyle, and the latter closely resemble the colourless cells of the blood. The nucleus of these corpuscles also may frequently be observed to have undergone the fissiparous division formerly described, and exhibit various stages of this process, in chyle taken from the thoracic duct. The opinion, therefore, held by many physiologists, that the colourless cells of the blood and those of chyle or lymph are the same, and consequently that in the highest class of animals they are not formed in the blood itself, but before they are mixed with that fluid, seems to be well founded.

According to Henle, the molecules of the chyle unite together in order to form the nuclei, which are afterwards surrounded by an envelope.[1] These, he thinks, are delayed, and become more fully

[1] Anatomie Générale, par Jourdain. Tom. i., p. 455.

developed in the lymphatic glands.[1] Nasse[2] also states, that he has seen aggregations of the chyle molecules and granular bodies, formed before they reach the lymphatic glands. On the other hand, it is certain that both nuclei and cells are most abundant in the glands themselves, and the cases of leucocythemia prove, that excess of colourless cells in the blood is not dependent upon an increase in the amount of chyle molecules, but is coincident with enlargement of the spleen and other glandular organs. It is to these, therefore, we must attribute the principal influence in the formation of the colourless cells, and to them evidently we must look for the origin of the blood-corpuscles.

Hewson considered the lymphatic glandular system to consist of the spleen, thymus, and lymphatic glands. He believed that particles were produced in these organs which ultimately became the blood-corpuscles, and that the spleen especially served to secrete the colouring matter which surrounded them. This doctrine, though supported to a greater or less extent by some German authors, has been repudiated by all British physiologists up to this time. Mr Simon[3] declares it to be impossible that the globules of the thymus can enter the lymphatic or blood-vessels, on account of the limitary membrane within which they are enclosed. But that they *do* find their way into those vessels was shown by Hewson and Sir Astley Cooper,[4] who found them there; and that the colourless corpuscles of the spleen and lymphatic glands enter the blood in large numbers, is proved by what occurs in leucocythemia, and by the great preponderance of these bodies at all times in splenic and portal blood.

But there are other glands which must be associated with those just mentioned as part of the lymphatic system, such as the thyroid

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[1] Anatomie Générale per Jourdain. Tom. ii., p. 103.
[2] Wagner's Handworterbuch. Arts., Chylus and Lymphe.
[3] On the Thymus Gland. P. 91.
[4] Anatomy of the Thymus Gland. Pp. 15 and 43.

body and supra-renal corpuscles. The pituitary and pineal glands have also been referred to the same class of organs by Oesterlen.[1] Without entering into lengthy anatomical details of each, it may be said that all these organs resemble one another in the following particulars:—

1. They consist of a fibrous stroma, enclosing spaces lined by a structureless membrane, which spaces are filled with colourless molecules, nuclei, and cells, in all stages of development.

2. The corpuscles of all these glands resemble one another,—the nuclei corresponding in size to the coloured blood-discs of mammals, and the cells corresponding to the colourless corpuscles of the blood. The very slight differences which do exist are at once explained by variations in the degree of development.

3. They have no excretory ducts, so that if the corpuscles formed in them are to leave the organs in which they originate, it can only be by the lymphatics or veins.

Now, it is certain that the blood of the splenic and portal veins, even in health, is always richer in colourless corpuscles than that of the systemic circulation.[2] It is also well known that in young animals the blood contains a larger number of these bodies than it does in their adult condition,—that is, when all these glands, including the thymus, thyroid, and supra-renal capsules, are fully developed and in a state of activity. In leucocythemia, we observe that when these glands are hypertrophied, and their corpuscular elements are multiplied, that the colourless corpuscles of the blood are increased in number. Two very carefully made observations, however, appear to me sufficient in themselves to determine the connection of these lymphatic glands with the cells of the blood. Thus in Case XXXIV., where the thyroid body was enlarged, its cells and their included nuclei were considerably smaller than usual, and it was ascertained

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[1] Beiträge zur Physiologie des gesunden und kranken Organismus. Jena, 1843.

[2] This well-known fact has lately been confirmed by the careful observations of Funke.—*Henle's Zeitschrift*, 1851, p. 172.

that the colourless bodies in the blood and their nuclei were smaller also. (Figs. 12, 13, and 14, pp. 75 and 77.) In Case XXXV. it was seen that the colourless corpuscles in the blood were of two distinct sizes, the smaller corresponding with the nuclei of the larger ones, and the lymphatic glands were found to be crowded with corpuscles also of two distinct sizes, exactly corresponding to those in the blood. (Figs. 16 and 17, p. 81.) From these facts, we can have little doubt that the colourless corpuscles are formed in the lymphatic glands, and from thence find their way into the blood.

By what channel they effect this, whether by the lymphatics, the veins, or by both, it is very difficult to determine. The limitary membrane which surrounds the sacular glands is exceedingly delicate; indeed so much so, that its existence has been denied by some observers. When distended, therefore, it may easily break, and the contents be poured into the pulp, surrounding stroma, or blood-vessels. Dr Sanders[1] has lately shown that the Malpighian sacs of the spleen are traversed by very large vessels. But it must be acknowledged, that notwithstanding the certainty which exists as to the connection between the closed lymphatic glands and the blood-vessels, and the passage of corpuscles from one to the other, the method by which this is accomplished has not yet been demonstrated. I cannot help thinking, however, that there must be a direct venous communication.

Of late years physiologists have been in the habit of calling these glands the blood glands, although nothing more definite has been determined with regard to them than that they are in some way subservient to nutrition, especially during an early period of life. But if I have been successful in establishing, that the corpuscular elements found in these organs are transformed into those of the blood, it will follow that the lymphatic glands secrete the blood corpuscles in the same manner as the testes secrete the spermatozoa,

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[1] Report of Physiological Society of Edinburgh, for January 31st, 1852. Monthly Journal for February 1852.

the mammæ the globules of the milk, or the salivary and gastric glands the cells of the saliva and gastric juice.

With regard to the exact mode in which the corpuscles are formed in the glands, two theories exist, both of which are dependent upon numerous facts and observations closely connected with the origin of all vital structures, and indeed of organization itself. One is, that they are thrown off, in the form of epithelium, from the membrane which surrounds them; the other, that they originate in an organic fluid, by the production of molecules, the successive development and aggregation of which constitute the higher formations.[1] I have long been of opinion, that the latter theory is the more consistent with known facts, and certainly all that I have seen during repeated investigations into the structure of the various lymphatic glands, is in harmony with it. Nowhere have I seen the nuclei and cells of these glands attached to, or apparently given off from, a membrane, still less from supposed fixed germs—but everywhere pervading a molecular fluid within the closed sacs. But however produced, whether from molecules or fixed germs, it is here they are formed, and are subsequently thrown into the torrent of the circulation,—there, colour is added to them, and they become blood corpuscles. Multitudes of free nuclei, in this way, join the blood, and are at once converted into coloured blood discs.[2] The cells circulate for a time as colourless corpuscles, but after a certain period their walls dissolve, when their included nuclei also become coloured discs. In the three inferior vertebrate tribes, the entire cell becomes oval, and assumes colour.

All that is known of the development of the blood corpuscles, on the one hand, and of the blood glands on the other, supports the

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[1] Report of Physiological Society of Edinburgh, for January 31st, 1852. Monthly Journal for April 1852.

[2] In making this statement, I am aware of the possibility of these nuclei being surrounded by a cell wall, so fine as not to be detected by the best instruments. But having confirmed the observations made originally with Oberhaeuser's microscope, by means of an excellent lens by Ross, of one-eighth of an inch focus, with the most careful attention to the management of the light, it is my conviction that the great majority of these bodies possess no cell walls.

theory now brought forward. The primitive production of blood in the embryo, occurs in the interior of cells in the vascular layer of the germinal membrane, which cells are afterwards transformed into vessels. At this period the colourless cells are very abundant, and their nuclei may be seen to undergo the fissiparous mode of multiplication formerly described; the cells themselves also in this fœtal condition, multiply by division.[1] In the invertebrate tribes, there are no lymphatic vessels or glands. In fact there is only one circulation, which has been shown by Milne Edwards to consist of a series of tubes, analogous to arteries or veins, which communicate by means of lacunæ that surround viscera. But the circulating fluid contains two distinct kinds of corpuscles, which Mr Wharton Jones has shown to be different phases of each other, and to correspond with the colourless and coloured corpuscles of fishes, reptiles, and birds.[2] In fishes a lymphatic system exists separately, and in them we first observe a pituitary body, supra-renal capsules, and a spleen. In reptiles there are added the thymus and thyroid glands, and in both these classes

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[1] These changes are well figured by Fahrner.—*De Globulorum Sanguinis*, &c. Turici, 1845.

[2] Henle seems to think that there are certain analogues to lymphatic glands in this class of animals, for he observes:—"In certain invertebrate animals the vessels which are bathed by the liquids contained in the cavities of the body, present appendices like a *cul-de-sac*, which open into these vessels, by which we are enabled without trouble to inject and distend them with air. These appendices may be compared to those of the lymphatics on the surface of the intestines which run into the villi, and draw from the intestinal cavity a liquid, which they immediately transmit to the plexus of lymphatic vessels. I have found the most simple appendices of this kind on the vessels of the mantle in the gelatinous ascidians (*phallusia*), where they are prominent on the surface of the animal's body like other villi. Stannius has seen the trunk of the ventral vessel of the arenicola furnished with a multitude of villi, generally long, terminating in *cul-de-sacs*, and frequently full of red blood. We have long known, on the branchial veins of the cephalopoda, appendices of this kind, true glands, filled with a whitish secretion. Each of these communicate by several openings with the cavity of the veins."—*Anatomie Générale, par Jourdain*, tom. 2, pp. 587-8. Should this view of the extension of a lymphatic system to certain invertebrata subsequently prove to be correct, it will serve to explain many of the facts pointed out by Wharton Jones,—especially the occurrence of a discoid and occasionally a coloured nucleus in the blood of some of these animals.

of animals the communications between the blood vessels and lymphatics are numerous and direct. In birds we first observe, in addition, glands on the lymphatics of the neck, but not on the lacteals, and there are two thoracic ducts. In the mammalia, the highest development of the lymphatic glandular system exists, including mesenteric and lymphatic glands, a spleen, thymus, thyroid, pineal, and pituitary bodies, and supra-renal capsules. Thus, we observe a correspondence between the amount of corpuscular elements in the blood, and the extent and complexity of the lymphatic glandular system. They are comparatively few and colourless in most of the invertebrata, and in such animals, as stated by Wagner, should be considered as analogous to those of lymph. They become more numerous and coloured, with the appearance of a spleen and supra-renal capsules, in fishes. Both in fishes and reptiles, however, the colourless cells are numerous. In birds the coloured cells are smaller, but still nucleated; and in mammals the coloured bodies are free nuclei, and are even much more abundant.

Another fact of great importance was pointed out to me by my former assistant, Mr Drummond, viz.,—that the numerous nuclei found in the spleen, varied in size in different animals, but always corresponded with the nuclei of the blood corpuscles. This statement I have confirmed in man and various mammals, in the frog, and in the newt. In the latter animal, the spleen corpuscles, like the nuclei of the blood, are very large.

With regard to the development of the lymphatic glands, it has been pointed out by Mr Goodsir,[1] that the thymus, thyroid, and supra-renal capsules originate from a mass of blastema at the upper part, and in front of the Wolfian bodies, in the embryo of sheep, and he has traced and described the mode in which this mass is transformed into the three organs. It is very possible that the spleen is developed either from the same, or from a neighbouring mass. Engel[2] has lately traced the develop-

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[1] Lond. Phil. Trans., 1846. [2] Prag. Vierteljahrschrift, 1 Band. 1850.

ment of the lymphatic glands, from the lymphatic vessels in sheep, first by a process of fissiparous division, and then by the formation of a cell which is subsequently converted into a contorted and multiple tube forming the gland. These points in embryology have yet to be confirmed and extended; but so far as they go, they offer additional arguments in favour of the theory I am advocating. It has been imagined, for instance, that the blood cannot be derived from chyle and lymph, because, in the embryo, the first is formed before the two latter fluids. It must be evident, however, that the formation of blood and lymph in the embryo resembles what occurs in the invertebrata, in which both fluids are formed together.

Again, it has been supposed that the coloured cannot be formed from the colourless bodies of the chyle,—1st, because the former can be seen of all sizes in the blood itself; 2d, because, on examining the blood of fœtal animals, no intermediate stages of growth can be seen between them; and, 3d, because, on the addition of acetic acid, while the coloured bodies are nearly dissolved, the naked nuclei of the chyle are not. Hence it is said they are of different chemical composition.

With regard to the first argument, derived from variations in size of the coloured particles, it may be said that, granting the fact, nuclei may also be observed both free and within cells, of all sizes, so that they correspond perfectly with the coloured corpuscles of the blood. Besides, in different cases of leucocythemia, although the colourless cells have been seen to be smaller, of the same size, somewhat larger, and even twice as large as the coloured bodies, their nuclei may always be observed to correspond exactly with the different phases of the latter. With regard to the second argument, advanced by those who have not succeeded in detecting transition forms in embryonal blood, I am persuaded that this arises from the circumstance, that attention is directed to the colourless cells, instead of to their nuclei. For my own part, I have never failed to observe all the changes previously described, not only in fœtal, but even in adult blood. As to the third objection, in reference to dissimilarity of chemical composition, it must be remembered that when the

chyle corpuscles enter the circulation by the left jugular or subclavian vein, they pass immediately through the pulmonary artery into the lungs, come in contact with oxygen, and undergo chemical changes, with which we are as yet unacquainted. Some physiologists have supposed that colour is added to them before they join the pulmonary circulation, because yellow corpuscles have been seen in the upper extremity of the thoracic duct. In all such observations, however, they have been necessarily exposed to the atmosphere; and I have frequently confirmed the observation of Emmert, viz., that the coagulum of chyle, at first colourless, becomes pinkish-red in contact with air. On this point I offer no opinion, believing that neither chemistry nor physiology has as yet communicated to us any exact information with regard to the when or how hæmatin is produced. But whatever the changes may be which occur in the lymph corpuscles on their passage into the lungs, to them we must attribute their altered chemical constitution, as observed colourless and insoluble in the lymphatic glands and in chyle, and coloured and partially soluble in the torrent of the circulation.

SECTION VII.

ULTIMATE DESTINATION OF THE BLOOD-CORPUSCLES.

There may frequently be observed in the spleen of all animals, groups of blood corpuscles, surrounded by an albuminous deposit closely resembling a cell wall. This fact has been differently interpreted. Gerlach is of opinion that they are new blood corpuscles

Fig. 25.

Fig. 25.—Cells with single and multiple nuclei, many of which latter in colour and form exactly resemble blood globules. From the human spleen. 250 diam. linear.

forming within a mother cell,[1]—whilst Kölliker[2] and Ecker[3] maintain that they are old ones, which, having fulfilled their functions in the circulation, go to the spleen, and are there dissolved. These large cells, containing several coloured nuclei, I believe to be cells of the lymphatic glands, which, under especial circumstances, assume power of increased development, with endogenous multiplication of nuclei. They are common not only in the spleen, but in the mesenteric and other lymphatic glands, especially when hypertrophied from neighbouring irritation, the result of inflammatory or cancerous exudations, and especially in typhoid fever. A similar increased power of development may occasionally be observed in the epithelial cells of the pulmonary air vesicles in certain pneumonias; in those covering the choroid plexus in hydrocephalus; in those of the epidermis in epithelial cancer; and in pus. On the other hand, that extravasated blood corpuscles may assemble together in groups, and subsequently be surrounded by an albuminous deposit closely resembling a cell wall, is a fact of great pathological importance.[4] It is true they closely resemble the lymph cells, with multiplying nuclei, but may, I think, be separated from them by possessing more colour. I have seen them not only in the spleen, but in other glands, and especially in the brain, following spon-

Fig. 26. Fig. 27.

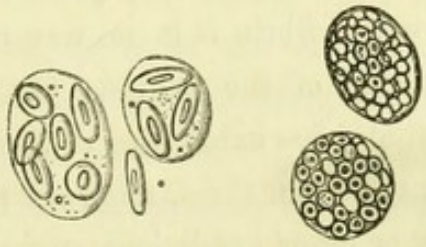

Fig. 26.—Groups of coloured blood corpuscles, surrounded by a transparent albuminous layer from the brain of a pigeon, which had been punctured three days previously.
Fig. 27.—Groups of blood corpuscles, surrounded by a similar layer, from an apoplectic extravasation in the human brain. 250 diam. linear.

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[1] Handbuch der Allgemeine und Speciellen Gewebelehre, &c., s. 53.

[2] Mikroskopische Anatomie, &c. 2 Band, s. 282.

[3] Wagner's Handwörterbuch. Art., Blukgefässdrüsen.

[4] See Dr Sanderson on the Metamorphosis of Coloured Blood Corpuscles, &c. Monthly Journal for September and December 1851.

taneous and artificial sanguineous extravasations. But surely it will not be maintained, that the normal function of the organs, in which these accidental formations occur, is to dissolve the blood corpuscles. Besides, from the numerous facts which have been referred to, I trust it has been made apparent, that the spleen is much more probably a blood-forming than a blood-destroying gland.

The view which seems to me most consistent with facts is, that the blood corpuscles are dissolved in the liquor sanguinis, and with the effete matter absorbed from the tissues by the lymphatics, constitute blood fibrin.

Fibrin has generally been supposed to be the most important element of the liquor sanguinis, and necessary for the evolution of the tissues. This idea was attacked by Zimmermann,[1] who endeavoured to show that it was the result of the metamorphosis of the textures, and constituted so far effete matter. The arguments by which he supports this view seem to me unanswerable. Thus there is no fibrin in the chyme, and very little in the chyle; and there is less in the chyle and blood of carnivora than of herbivora. Hence fibrin cannot be a result of the primary digestion. In the egg there is no fibrin, although organisation is proceeding rapidly in it. Again, the blood of the fœtus possesses no fibrin (Jennings, quoted by Zimmermann), and that of the newly-born infant very little.[2] Nasse found it to contain its normal quantity at four years of age. These facts are sufficient to prove that fibrin is in no way necessary to cell development and formation of the tissues. On the other hand, all those circumstances that cause exhaustion of the textures, or increase the amount of absorption from these, augment the amount of fibrin, as after inflammatory or other exudations, starvation, violent fatigue, pregnancy, and frequent bleeding or hemorrhage. Both Nasse and Zimmermann found it far more abundant in lymphatic, weak per-

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[1] Zur Analysis und Synthesis des pseudoplastischen Processe. Berlin, 1844.

[2] The quantitative analysis of fœtal blood is still a desideratum. I have, however, seen a coagulum in blood squeezed from the placental vein; and Mr Drummond informs me that he also has occasionally seen a coagulum in fœtal blood. The above statement by Zimmermann, therefore, requires modification

sons, than in those who are strong and vigorous. Again, while there is little fibrin in the chyle of the lacteals, it exists in great quantity in the lymph of the lymphatics, as determined by Nasse in man, and Müller in frogs.[1] It follows that the primary digestion must transform fibrin into albumen, rather than the latter into the former; and such is very probably also the result of the secondary digestion. How otherwise could so small a quantity, as from one and a half to three parts in a thousand, exist in healthy blood—an amount altogether disproportionate to what would be required, did this constituent build up the tissues as such? We observe, however, that increase of fibrin is generally accompanied by proportionate decrease in the corpuscles. Thus, in the blood of robust persons there is excess of corpuscles, but little fibrin; whereas, in weakly, phthisical, or chlorotic individuals, the globules are diminished, and the fibrin increased.[2]

It appears, therefore, probable that the fibrin results partly from a solution of blood corpuscles, and partly from the effete matters of the tissues. Hence why absorption of exudations, or of the textures from exhausting causes, will produce increase of this constituent in the blood, as well as an increase in the disintegrating process of the blood corpuscles themselves. In leucocythemia an increased number of colourless cells are thrown into the blood, and fewer free nuclei. The former, consequently, float as colourless corpuscles in the circulation. Solution of cell walls must be effected to a greater extent than occurs in health, and hence we find the fibrin increased.

It has been maintained by some that fibrin is secreted by the blood corpuscles. Dr Carpenter supposed this to be the especial function of the colourless cells,[3] and Mr Wharton Jones of the coloured nuclei.[4] But there are facts proving that fibrin must

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[1] Zur Analysis und Synthesis des pseudoplastischen Processe. Berlin, 1844. P. 19.

[2] Ibid, p. 16.

[3] British and Foreign Medical Review, vol. xv., pp. 272, 273.

[4] Ibid, vol. xiv., p. 597.

have a double origin as I have stated, one in the solution of both kinds of corpuscles, another from the tissues, of which its increase during inflammation and in rheumatism are examples, although in these morbid states, increase in the colourless or coloured corpuscles is certainly not essential. Hence fibrin must be referred to a process of disintegration, rather than to one of evolution,—but even in this capacity, may serve to produce higher elaboration of that complex fluid, the blood.

From the various facts which have been stated, I think we may conclude :—

1. That the blood corpuscles of vertebrate animals are originally formed in the lymphatic glandular system, and that the great majority of them, on joining the circulation, become coloured in a manner that is as yet unexplained. Hence the blood may be considered as a secretion from the lymphatic glands, although in the higher animals that secretion only becomes fully formed after it has received colour by exposure to oxygen in the lungs.

2. That, in mammalia, the lymphatic glandular system is composed of the spleen, thymus, thyroid, supra-renal, pituitary, pineal, and lymphatic glands.

3. That, in fishes, reptiles, and birds, the coloured blood corpuscles are nucleated cells, originating in these glands; but that, in mammals, they are free nuclei, sometimes derived as such from the glands; at others, developed within colourless cells.

4. That, in certain hypertrophies of the lymphatic glands, their cell elements are multiplied to an unusual extent, and under such circumstances find their way into the blood, and constitute an increase in the number of its colourless cells. This is leucocythemia.

5. That the solution of the blood corpuscles, conjoined with the effete matter derived from the secondary digestion of the tissues, which is not converted into albumen, constitutes blood fibrin.

These conclusions, together with other inferences which naturally flow from the facts previously detailed, must exercise an important

influence on several pathological doctrines. As it will require much time and observation, however, to investigate these with the care they require, I shall content myself with a short description of such only as appear to me at present most intimately connected with the subject. I shall also indicate what seem to be desirable objects for further investigation.

SECTION VIII.

LEUCOCYTHEMIA VIEWED IN RELATON TO INFLAMMATION.

The essential phenomenon of inflammation is exudation of the healthy liquor sanguinis, through the walls of the capillaries.[1] The circumstances which lead to that exudation, though now tolerably well understood, have been differently explained by various writers. Thus the occasional and accidental accumulation of the colourless corpuscles within some of the smaller vessels were considered by Drs Addison[2] and J. C. B. Williams as an important, and even essential, part of the process. The latter author observes :—"It seems, then, to be well established that an essential part of inflammation is the production of numerous white globules in the inflamed vessels; and that the obstruction of these vessels is mainly due to the adhesive quality of these globules."[3] Shortly after these views were published, I made the following statement :—"Without denying the occasional accumulation of these lymph corpuscles in certain vessels, I must record my conviction, that inflammation, accompanied by complete obstruction, may be frequently occasioned, independent of any such phenomena."[4] Numerous observations, again and again repeated, having fully convinced me that excess of

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[1] See the author's treatise on Inflammation as a process of Anormal Nutrition, chap. v. Edinburgh, 1844.

[2] Medical Gazette, January 29, 1841.

[3] Principles of Medicine, 1st edit., p. 413. 1843.

[4] Edinburgh Medical and Surgical Journal. October 1843.

colourless corpuscles had nothing to do with the stoppage of the blood in inflammation, I concluded an account of these with the following passage, in 1847 :—"It may be concluded, then, that there is no increase in the white corpuscles in inflammation,—no crowding together of them, so as to produce obstruction of the vessel," &c.[1] Notwithstanding these observations, however, Dr Williams pertinaciously maintained this doctrine in the second edition of his work, published in 1848, observing, in allusion to the obstruction of vessels in inflammation :—"The chief cause of obstruction seems to be comprised in the two circumstances—the increased production of the white globules, and their remarkable disposition to adhere to the walls of the vessels and to one another."—P. 260.

This theory, which never reposed on accurate observation even in frogs, may be considered to have received its *coup-de-grace* by the discovery of leucocythemia in man. Here the colourless corpuscles *are* increased in number in the smallest vessels, and yet, instead of a universal inflammation, persons live in that condition for months and years, without any obstruction of the vessels whatever. Next to the discovery of what is new, the progress of science is most advanced by the expulsion of the erroneous observations and imperfect theories which encumber it.

Neither can the view of Mr Wharton Jones, who considered inflammation primarily to depend upon increased spissitude of the blood, and adhesion of the coloured corpuscles to one another and to the vascular walls, be considered tenable.[2] The facts recorded in the first part of this memoir demonstrate that in one instance the fibrin was augmented to 7·08 parts in a thousand (Case XX.), in another it was increased to 6·0 in a thousand. (Case II.) On examining the blood immediately after its abstraction from the living body in several cases of leucocythemia, the coloured corpuscles were seen to aggregate themselves together in the manner so accurately

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[1] Monthly Journal of Medical Science, p. 505. January 1847

[2] Guy's Hospital Reports, Second Series. 1850

described by Mr Wharton Jones. The same facts were observable in Cases XV., XXXII., and in other instances; but in none of them were the smaller vessels and capillaries obstructed, or the phenomena peculiar to inflammation induced.

On the other hand, every known fact convinces me, and the progress of science only adds strength to my convictions, that we must ascribe the ultimate cause of inflammation to a derangement of those forces which regulate the nutritive powers of the economy, and that the only correct definition of inflammation itself is—an exudation of the normal liquor sanguinis. It is in vain that physiologists seek in the alterations of the vessels on the one hand, or in morbid changes of the blood on the other, for the primary cause of this important condition. Facts prove that both are more or less affected, and also show that neither the one change nor the other, nor the two combined, constitute inflammation. The vital properties of the tissues (understanding by these the unknown conditions necessary for carrying on the nutritive processes) are in all such cases deranged, and such alteration is the cause of the changes which have been referred to, and not the effect.

SECTION IX.

LEUCOCYTHEMIA VIEWED IN RELATION TO PURULENT INFECTION.

That morbid condition, so much dreaded by surgeons and obstetricians, in which typhoid fever comes on after severe accidents or parturition, accompanied with purulent infiltration, or multiple abscesses, in one or more organs, has received different explanations. The various observations and experiments performed with a view of elucidating this subject in modern times have led to the four following theories:—

1. That this condition is owing to an admixture of the blood with pus (pyohemia of Piorry), and that the pus corpuscles being larger

than the coloured ones of blood, are arrested in the minute capillaries, and give rise to secondary abscesses.

2. That it is owing to the presence of any irritating body, which cannot be eliminated from the economy, producing capillary phlebitis.

3. That it is dependent on a property possessed by pus of coagulating the blood.

4. That it is caused by the presence of a peculiar poison which contaminates the system.

All these views have been maintained with much ingenuity, and they are all supported by experimental and clinical researches. A knowledge of the circumstances previously detailed concerning leucocythemia will enable us to criticise these doctrines from a new point of view.

With regard to the first theory, it must, I think, be granted by all those who have examined the blood in leucocythemia, or will study the figures in the first part of this memoir, that no difference whatever can be detected between the colourless cells of the blood and those of pus. Their general appearance, size, structure, and behaviour, on the addition of re-agents, are identical,—indeed so much so, that in the first case I observed in 1845, I could not resist the conclusion that the blood was crowded with pus cells. It follows, that all explanations of purulent infection founded upon the mechanical impaction of these bodies in the minute capillaries must be erroneous. Some of these colourless corpuscles have been observed much larger than ordinary pus corpuscles. (Case IV.) In one instance—a man still living—many of them were twice as large, and although this may in some measure be owing to endosmosis of serum, there can be little doubt that they must have exceeded the usual size of pus cells. (Case XXXVII.) In Case II., also, it was observed that several of the colourless cells were larger than the average, and yet the circulation went on, and every drop of the patient's blood contained hundreds of these bodies. The first theory, then, is no longer tenable.

Neither does there seem to be anything peculiar in the substance

of good and laudable pus, which necessarily leads it to poison the blood; for it is a matter of common observation, that large abscesses are absorbed and eliminated without occasioning so-called purulent infection. In all such cases, the pus corpuscles must, in the first instance, be disintegrated and reduced to a fluid condition; still the matter or substance of which they were composed passes into the blood. Hence, while leucocythemia proves that corpuscles, identical in form, size, structure, and chemical composition with those of pus, may float in the blood and circulate innocuously, the well-known fact of the absorption of abscesses demonstrates, that pus, when healthy, is not associated with any poisonous properties. If, then, the fever and other marked symptoms are owing to pus, it must be pus possessing properties wholly different from that which is generally called good or laudable.

The second explanation was advanced by Cruveilhier, who, on injecting mercury, ink, and other substances into the blood of a living animal, found that the multiple abscesses were formed wherever these accumulated. Hence impaction of some substances, and consequent local inflammations, *may* lead to abscesses; but that such is not the necessary result of admixture of pus with the blood, is proved not only by the previous observations, but by numerous experiments of Lebert[1] and Sédillot,[2] in which the animals recovered.

The third doctrine was advanced by Mr Henry Lee,[3] and resulted from observing that when pus was mingled with recently-drawn blood, it coagulated more rapidly and more firmly than under ordinary circumstances. This observation he connected with the well-known fact, that phlebitis was often associated with coagula causing obstruction of the veins. Now it is worthy of remark, that in decided cases of leucocythemia the blood is more highly coagulable when drawn from the arm, and after death it often presents firm coagula filling the vessels, as in Case I. Plate I. illustrates these

[1] Physiologie Pathologique, tom. i., p. 313.
[2] De L'Infection Purulente, p. 73, *et seq.*
[3] On the Origin of Inflammation of the Veins. London, 1850.

colourless coagula, as observed in different parts of the body. The same occurred in Case II.; and yet, during the life of the patient, the blood, loaded with the colourless corpuscles, rolled through the vessels without impediment or the formation of coagula. It does not follow, then, that because dead pus is mingled with recently-drawn blood about to coagulate, that therefore it should induce coagulation of living blood in the vessels of an animal. Indeed, numerous experiments by Lebert and Sédillot show that such does not take place; for, although in some cases death followed, in others the animals lived, and the pus corpuscles were dissolved. Hence, although the fact to a certain extent must be admitted, that when pus is mingled with blood the coagulum formed is more firm, it by no means follows that it produces coagulation of *living blood*, and is the cause of phlebitis or purulent infection.

The fourth theory seems to have been maintained by A. Boyer[1] and Bonnet,[2] who believed good pus to be innocuous, and the bad effects occasionally produced to depend on its becoming putrid, or being otherwise altered. This view was also more or less supported by Darcet[3] and Berard,[4] who, in order to explain the undoubted effects of putrid substances when injected into the veins, separated pyohemia from purulent infection. But as pus corpuscles do not alone cause the symptoms, it is certainly more probable that, in all cases, there must be a toxic effect associated with pus when it proves mortal. Dr Millington[5] has shown, in repeating Mr Lee's experiments, that putrid fluids prevent coagulation of the blood, and that the coagulum caused by the addition of pus is more perfect the fresher the purulent matter is. This fact is opposed to the idea, that multiple abscesses are induced by the coagulation, but corresponds with what is observed after death in cases of purulent infec-

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[1] Gazette Méd. de Paris, p. 193. 1834.
[2] Ibid., p. 593. 1837. Both cited by Sédillot, Op. cit., p. 55.
[3] Thése Inaugurale. Paris, 1842.
[4] Dictionnaire de Méd., tom. 26. 1842.
[5] Monthly Journal. November 1851. P. 486.

tion. When, therefore, we consider the typhoid nature of the symptoms so similar to that of certain animal poisons; the multiple abscesses so analogous to what occurs in glanders, plague, syphilis, variola, &c.; and the undoubted fact, that the blood may be loaded with corpuscles in every respect identical with pus cells, without causing these symptoms, the irresistible conclusion is, that these effects are not owing to pyohemia, but to an animal poison.

This view has been opposed on the ground that fresh pus, to all appearance healthy and without odour, has yet caused the death of animals. But what sensible property distinguishes the pus of the vaccine from the small-pox pustule, and either of these from healthy pus? And yet how different their effects when introduced into the blood! The subject of animal poisons is certainly obscure; but we advance our knowledge by attributing purulent infection to this cause, rather than in considering it to be the mere mixture of pus with the blood, or a so-called pyohemia.

SECTION X.

LEUCOCYTHEMIA VIEWED IN RELATION TO PHLEBITIS.

In none of the cases of leucocythemia could phlebitis, though carefully looked for, be anywhere discovered. Although, in some instances, the clot was firmly coagulated, its colourless portion of a dull colour, very friable, and containing a multitude of corpuscles identical with those found in pus, nowhere was it adherent to the vessels. This was well observed in Case I.; and the figures given in Plate I. show the veins of their normal transparency and thickness, notwithstanding the alteration in the blood. In phlebitis the effects are different. The vein is more or less thickened, the coagulum inside adherent, and obstruction of the caliber of the tube occasioned. From the numerous cases of phlebitis observed, especially when it originates in the uterine veins, the same general symptoms are produced as in the so-called cases of purulent infec-

tion. This indeed has been considered by many as the source of the pus corpuscles which mingle with the blood. But it is by no means shown, that, under such circumstances, the pus corpuscles actually circulate in the blood, much less that, if they did, the fatal result can be attributed to them. On the other hand, from the epidemic nature of the disease in puerperal women, and from its contagious character, a point which seems to be well established among practical obstetricians, it is more probable that here also a toxic effect is occasioned, which operates on the blood altogether independent of the pus corpuscles.

There can be no doubt that when, owing to phlebitis, a coagulum forms in the vessel, and obstruction of the blood occurs, that the clot softens, and is converted into pus. I have frequently seen such softened clots in veins, and on the internal surface of the cardiac cavities, to be composed of colourless cells, presenting all the characters of pus corpuscles, floating in a slightly molecular fluid. In most cases these corpuscles are prevented from entering the circulation, on account of firm fibrous coagula existing between the diffluent portion of the clot and the moving blood. But it is maintained, that occasionally the whole suppurates, and, on joining the circulation, causes the symptoms of purulent infection. If so, I argue the effect must depend upon either the toxic power of such pus, or upon fragments of the coagulum being carried into the circulation, and acting mechanically, as the mercury did in the experiments of Cruveilhier. This point, however, in the history of phlebitis, requires further investigation, as well as the separation of such mechanical effects, should they occur, from the poisonous influence of altered or putrid pus.

From all that is known of the morbid anatomy of phlebitis, of the symptoms it occasions, and of the absence of these in cases of leucocythemia, it follows, not only that these symptoms are not occasioned by the circulation of colourless corpuscles in the blood, but that the conclusions formerly arrived at, as to the origin and physiological importance of these bodies, are correct.

SECTION XI.

ON THE RELATION BETWEEN MORBID CONDITIONS OF THE LYMPHATIC GLANDULAR SYSTEM AND OF THE BLOOD.

It is a matter of common observation, that the lymphatic glands and vessels swell in the neighbourhood of an irritating wound, and that the former are especially liable to become the seats of cancerous and tubercular matter, apparently from the result of absorption from primary sores or lesions. The nature of this enlargement in lymphatic glands has not hitherto been very clearly understood. Generally speaking, it is attributed to secondary inflammation, which, if not subdued, advances towards suppuration, and in its time becomes the source of similar lesions in the next series of lymphatic glands.

On examining glands which become enlarged from the result of irritation from a neighbouring ulcer, we find them to be soft, and readily to yield on section a dirty turbid fluid. If we examine this fluid under a magnifying power of 250 diameters linear, we find it to be crowded with naked nuclei and the cell elements of the gland, some of which last are frequently enlarged, and contain a considerable number of nuclei. It would appear that, under these circumstances, the nuclear and cell elements not only increase in number, but that some of the latter assume a power of development which they never present in a state of health. For instance, instead of there being one nucleus, it multiplies fissiparously, so that there are two, four, or even a greater number.

This condition is remarkably well observed in the enlarged mesenteric glands which accompany typhoid ulcerations in the intestines. They are then greatly distended, varying in size from a hazel nut to that of a hen's egg. They are externally vascular, of a bright red or purple colour, are soft and pulpy to the feel, and, on section, present a slightly granular surface, of grayish or fawn-yellow colour, and frequently exhibit commencing softening. They are

friable, and yield a grayish or dirty purulent-looking fluid, on examining which with a magnifying power of 250 diameters, it will be found to contain numerous cells, generally spherical, varying in diameter from the 1-150th to the 1-35th of a millimetre. In some cases the nucleus occupies three-fourths of the cell, and is composed of an aggregation of numerous nucleoli, of about the 1-200th of a millimetre in diameter. (Fig. 28.) At other times, from one to four of these nucleoli may be seen scattered within the cell, either with or without a round or oval transparent nucleolated nucleus. (Fig. 29). On the addition of acetic acid, the cell wall is rendered

Fig. 28. Fig. 29. Fig. 30.

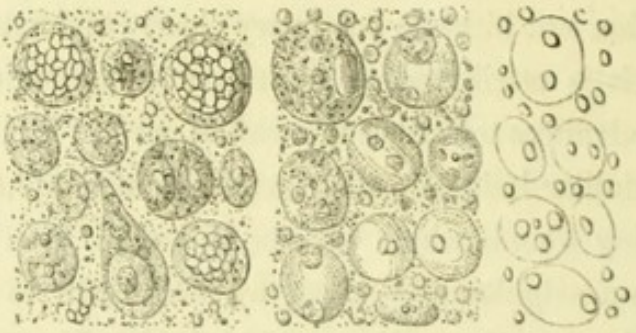

Fig. 28.—Cells from a mesenteric gland enlarged in typhoid fever.
Fig. 29.—Cells from a gland similarly affected in another case.
Fig. 30.—The same after the addition of acetic acid.

very transparent, whilst the nucleoli are unaffected. Many of them are free, and at first look like altered blood corpuscles, from which they are at once distinguished by the action of acetic acid. (Fig. 30.)

This power of increased development may be observed not only in the mesenteric, but in the spleen and other lymphatic glands. In a case of large epithelial ulcer of the leg, I examined the glands after death with great care, and found them greatly enlarged, dependent apparently on the excess of naked nuclei and increased number of cells they contained. I have observed the same alteration in the axillary and cervical glands. Its occurrence in the spleen has been previously noticed. This enlargement and softening of glandular organs is strictly analogous to what occurs in articular cartilages, from the increased development of cells, and a multipli-

cation of nuclei within them, as observed and accurately figured by Dr Redfern.[1]

In certain morbid conditions, I have seen the ordinary epithelial or epidermic cells of an organ present the same tendency to multiplication. Thus, in the lung in certain cases of typhoid pneumonia, I have seen the epithelial cells exhibit the same multiplication, with increase of of nuclei. (Figs. 31 and 32.)

Fig. 31. Fig. 32. Fig. 33.

Fig. 31.—Appearance of exudation and epithelial cells in the lung in a case of typhoid pneumonia.
Fig. 32.—Another portion of the same lung, after the addition of acetic acid.
Fig. 33.—Portions of normal epithelium separated from the air vesicles.

In the epidermic cancroid disease observed in the lips, and in the scrotum of chimney sweeps, the epidermic scales increase far beyond their normal size; the cells and nuclei also enlarge, and the latter often exhibit a disposition to multiply fissiparously, as in the accompanying figure, where an enormous cell of this kind was found in a labial ulcer. (Fig. 34).

Fig. 34.

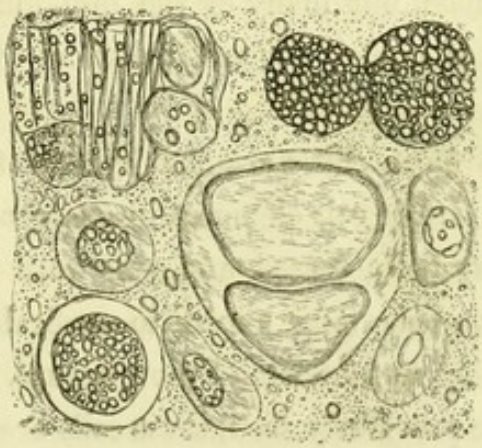

Fig. 34.—Cells from the central softened portion of a cancroid ulcer of the lip.

[1] On Anormal Nutrition in Articular Cartilages. Edinburgh, 1851.

In certain tumours of the mammæ, the ducts also may be observed to become distended with epithelial cells, as in the following figure, constituting an increased growth of cell elements, which obstruct the

Fig. 35. Fig. 36. Fig. 37.

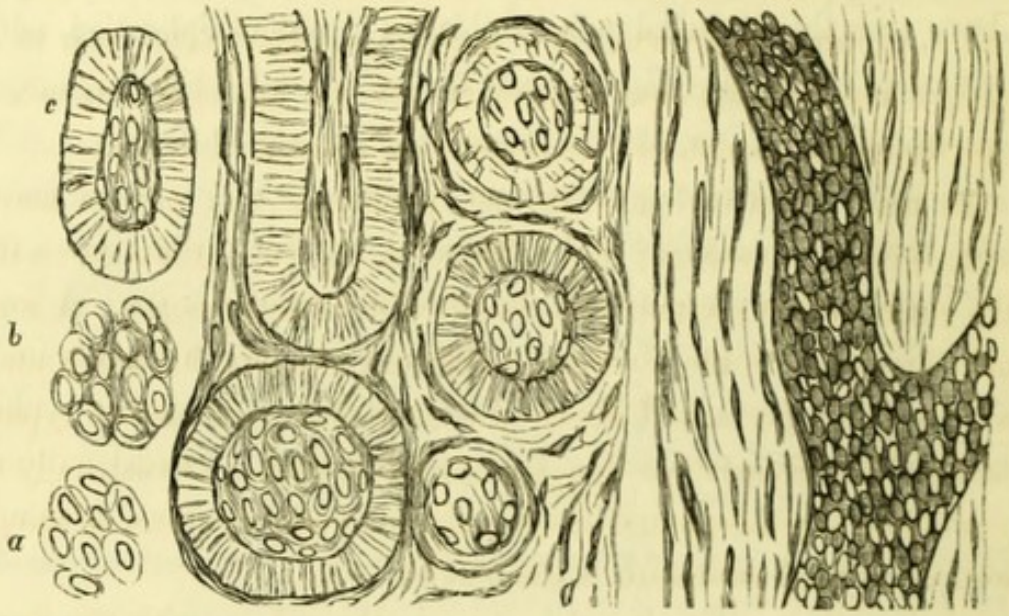

Fig. 35.—*c*, Section of the epithelium from one of the tubes in a cancroid tumour of the mamma; *b*, Group of epithelial cells from the same; *a*, The same after the addition of acetic acid.
Fig. 36.—Thin section of the same tumour, after the addition of acetic acid.
Fig. 37.—Another section transverse to the former, similarly treated.

tubes. A similar fact may be exemplified in tumours of the parotid, and in certain cases of cerebral meningitis affecting the ventricles, when the epithelium covering the choroid plexus is not only greatly increased in thickness, but many of the individual cells exhibit an increased number of nuclei, altogether distinct from fatty degeneration.

From all these facts, therefore, it is evident that, under certain conditions, the growth of cell elements in an organ, or on the surface of membranes, may be increased, and constitute diseases, the symptoms of which have been long known to medical men, although we are only commencing to understand their nature. In the lymphatic glands, as we have previously seen, these cells are frequently formed, and many of them enter the blood, and are visible there, constituting leucocythemia. An extensive inquiry is thus thrown open to the histological pathologist, having reference to the questions, how far

do structural alterations in the lymphatic glands affect the blood? and how far do alterations of the blood re-operate upon the glands?

A peculiar alteration is occasionally observable in the spleen, which, it appears to me, can only be explained by the assistance of the facts previously detailed. I allude to the occurrence of an opaque discoloration and destruction of the glandular tissue, of greater or less extent, closely resembling a so-called deposit.

In many cases of leucocythemia, patches of this whitish matter were seen in the spleen; and in Plate II. the cut surface shows that the entire spleen presents this alteration in various stages. A series of preparations in the University Museum exhibits this lesion under a variety of aspects, as I observed it during an epidemic of typhoid fever which occurred in this city during 1846–7. Occasionally the morbid mass softens round its circumference, and separates or sloughs out, when fatal peritonitis is the result.

On examining this altered texture in the spleen, with a power of 250 diameters linear, it is found to consist, of — 1st, Numerous molecules and granules; 2d, Free nuclei; 3d, Compound granular cells of various sizes; 4th, Fragments of the fibrous tissue and fusiform corpuscles of the organ. (Fig. 38.) The granular cells were

Fig. 38. Fig. 39.

Fig 38.—Structure of a discoloured mass in the spleen.
Fig. 39.—The same after the addition of acetic acid.

frequently ruptured, more or less broken down, and appeared to me to be the remains of the large glandular cells formerly figured (Figs. 28 and 29), which had undergone a disintegrating process. It is very possible that, under certain circumstances, the glandular cells

enlarging in the manner previously described, cannot escape from the organ, and by aggregating together do not discharge their nuclei. They then undergo a disintegrating process, which constitutes the morbid alteration now alluded to.

A somewhat similar lesion, probably dependent on the same series of changes, is occasionally observable in the kidney and mesenteric glands. The alteration known as waxy liver is apparently allied to an analogous transformation. Here the tissue presents the appearance of yellow bees' wax; and the cells of the altered structure, instead of being filled with oil globules, as in the fatty liver, are empty, colourless, compressed together, and more or less collapsed and broken down. Hence there is not only a lesion dependent on excess of cell element, and multiplication of included nuclei, but its history may be traced by alterations in texture resulting from the disintegration of such cells.

The history of all these lesions has yet to be written. But the time, I trust, is not now far distant when a systematic pathology may be rendered possible, on the basis of chemico-histological research. Happily there are many men in this and foreign countries who are laboriously toiling to unravel the mysteries of altered structure, in connection with the clinical study of disease. To their investigations we must look as the only means of so advancing pathology, that it may be received by the profession as the true basis of a rational system of therapeutics.

In conclusion, I would direct the attention of my medical brethren to an extended study and investigation of the blood clinically. The means of doing this, with the assistance of the microscope, are now most easily attainable,[1] and the following points deserve attention:—

1. In some cases of typhoid fever, where there was every reason to expect disease of the intestinal glands, the colourless corpuscles

[1] See the Author's Lectures on Clinical Medicine. Part V. Edinburgh: Sutherland and Knox. 1851.

have been stated to be increased in number. The importance of this observation will be recognised, when it is remembered, that, according to Brucke, these structures constitute the first series of the lymphatic glands. Further observations on an extended scale, however, are required, especially in France and Germany, where intestinal fevers are so common.

2. An examination of the blood in cases of bronchocele seems advisable, especially in places where it is endemic.

3. In all cases where the blood glands are extensively affected, whether from hypertrophy, scrofula, or cancer, it is possible that the blood may be found more or less altered in the relation of the colourless to the coloured corpuscles. If so, further research may explain the contradictory statements which have been advanced, having reference to the actual detection of cancer cells in the blood.

4. In all cases of abdominal tumours, as a general rule, it may be well to examine the blood microscopically.

5. This should also be done in cases of purulent infection, puerperal fever, small-pox, glanders, syphilis, and all other disorders where the blood is affected on the one hand, and the lymphatic glandular system on the other.

6. A chemical analysis of the blood in such cases is desirable, as it is only by a multiplication of such observations that fair average results can be arrived at.

7. There are some cases of anemia which kill, apparently without obvious cause. In these it may be well to examine the lymphatic glands. In a boy who so died in Heriot's Hospital, under the care of Drs Christison and Andrew Wood, the only lesion discovered after death was induration and cell disintegration of the mesenteric glands.

All this constitutes a series of researches, which can only be carried out by interesting different individuals, especially those engaged in pathological investigation in large hospitals. Such, however, may be considered as absolutely necessary information to be obtained, before the laws of nutrition and the diseases connected with their derangement can be fully understood.

APPENDIX TO PART II.

WHILST the latter pages of this monograph have been passing through the press, two other cases of leucocythemia have come under my notice, a short account of which may be inserted here.

CASE XXXVI.—*Commencing Leucocythemia determined during Life; Enlarged Spleen and Liver; Ascites.*

Thomas Welsh, a sailor, æt. 20, admitted into the Clinical Ward of the Royal Infirmary, September 22d, 1851. In June 1847, he first experienced a gnawing pain in the left side, and a hard swelling was distinctly felt in the splenic region. Shortly afterwards he was attacked with jaundice, and he became sensible of a swelling also on the right side of the abdomen. He says, that, owing to medical treatment, this latter swelling disappeared, and he regained his health. Since then he has occasionally had attacks of jaundice, and the abdomen has slowly enlarged, notwithstanding the internal use of large quantities of mercury and iodine.

On admission, his body generally is emaciated; the abdomen is considerably enlarged, measuring thirty-two inches round the most prominent part, which is two inches above the umbilicus; no fluid can be detected. The hepatic dulness measures vertically at its deepest part six inches, and its lower margin can be distinctly felt below the ribs, the left lobe sweeping backwards and upwards, and apparently coming in contact with the spleen. The splenic dulness measures vertically eight and a quarter inches; the anterior margin can be distinctly felt, with a notch in its centre, terminating on a level with the upper edge of the iliac bone. Bowels are generally loose; respiration is embarrassed and thoracic; no dulness on percussion over the chest; no cough, but occasional sibillation heard on auscultation; impulse of heart feeble, otherwise normal; pulse 78, small and weak. He has not increased in stature since he was sixteen, and has the exter-

nal aspect of a boy of that age; generative organs not developed; urine healthy; skin of a dingy yellowish colour. On microscopic examination of the blood, it was ascertained that the colourless and coloured corpuscles presented their normal relative number.

It is unnecessary to follow the progress of this case minutely. It will suffice to say, that the bowels every now and then became very loose; he occasionally had epistaxis, and frequently more or less tenderness over various parts of the swollen abdomen. In October, he experienced a severe attack of acute laryngitis, from which he recovered in fifteen days. During the latter part of December ascites came on, the excretion of urine diminished in amount, and it was intensely loaded with lithates. The blood had been examined from time to time; and on the 3d of January, a decided increase of the colourless corpuscles were observed. A diuretic treatment, by increasing the amount of urine, caused the ascites to diminish. But the number of colourless corpuscles gradually increased, so that, during the whole of February, considerable groups of these bodies could be seen between the rolls of coloured discs in a demonstration under the microscope.

Latterly, his general strength became much diminished; but his mother insisted on taking him home to Berwick, and he left the Infirmary, Feb. 27th, 1852.

As soon as it was determined that the colourless corpuscles of the blood had decidedly increased, I requested Dr W. Robertson to analyse the blood, which he did on the 7th of January, with the following results:—The blood coagulated firmly, but little serum exuded from the coagulum, although it stood undisturbed for forty-eight hours. Surface of coagulum flat, and thinly coated with fibrin.

Density of blood, ...	1043·5
" of serum, ...	1027·

Composition of 1000 *parts.*

Fibrin,	... ...	3·2
Serous solids,	Organic, 70·4 / Inorganic, 10·3	80·7
Globules,	... ...	82·3
	Total solids, ...	166·2
	Water, ...	833·8
		1000

The above case fills up the blank indicated in the history of leucocythemia at page 89, the change in the blood having been observed to

commence and go on increasing in a case of chronic enlargement of the spleen and liver. In many other particulars, also, the case resembled that of Tinlay. (Case II.)

For the next case I am indebted to Dr Monro of Dundee, who has the patient at present under his care. The following is the note he gave me concerning it :—

CASE XXXVII.—*Leucocythemia detected during Life; Enlargement of the Spleen.*

Mr A. R., farmer, æt. 45, of a spare habit and dark complexion, has been long a martyr to dyspepsia and its numerous concomitants, especially headaches, for which he has used a host of remedies, medicinal and dietetic, with only partial or temporary benefit. About the beginning of last January, when complaining more than usual, especially of pain and uneasiness of left side, I examined the chest, and found, along the lower margin, extending upwards to within three inches of left nipple, great dulness on percussion ; and in the abdomen on the same side, was a large tumour, of firm consistence, extending downwards as far as the umbilicus, and filling almost the whole of the upper portion of left side of abdomen, at its lower extremity especially ; it was moveable, and the fingers could be introduced beneath it for a little way. On the 19th of the same month he suffered severely from violent pain in the situation of the tumour, with great flatulent distension of the stomach. Large doses of morphia alone afforded relief, which he continued to use, more or less, for about a fortnight. During this period, also, he took mercurials, to affect the mouth slightly, the bowels being kept daily open by laxatives ; and externally the tumour was brushed with tincture of iodine. Latterly, suspecting that the tumour might be enlarged spleen, and the case one of leucocythemia, I examined the blood by the aid of the microscope, and found numerous colourless blood corpuscles, exactly resembling those described and delineated by Professor Bennett in the "Monthly Journal."

Since this period he has been using a mixture of sulphate of quinine and tincture of muriate of iron, keeping the bowels daily open by means of pills of aloine, jalapine, and extract of hyoscyamus, and a large opiate plaster to cover the whole swelling. Under this treatment he has improved considerably. He has no pain, except when he exceeds in taking too much food, for he has a keen appetite ; he has gained strength, and is able to attend to his out-door duties. The pulse has been always naturally slow, and all the other functions are natural and healthy.

March 2d.—On examining the tumour this day it seems smaller ; has almost

no pain on pressing it; his health and strength are decidedly improved; and he takes almost daily exercise in the open air, and otherwise attends to the duties of the farm, &c.

Upwards of twenty years ago, he informs me, he suffered from a severe attack of inflammation of some of the abdominal viscera, for which he was largely blooded and cupped; but was not aware until the beginning of the present year, of any swelling in the abdominal region; but conceives it quite possible that such a tumour may have existed without his being conscious of it.

WM. MONRO.

Dundee, 2d March 1852.

On examining the blood kindly sent me by Dr Monro, I found the colourless corpuscles almost as numerous as in Tinlay's case. (Case II). I placed the bottle, containing an ounce, which had been previously defibrinated, in the hands of Dr Robertson for analysis, to whom I am indebted for the following note:—

Analysis of Blood from Dundee.

The blood seemed to have been thoroughly defibrinated. A drop exposed to the air soon assumed the arterial hue. After remaining undisturbed for a few hours, it had formed *three* distinct strata,—the first, and lowest, amounting to *four-sevenths* of the mass, and consisting of dark fluid blood, together with the fibrin and zinc fragments, which had been used to promote its separation; the second and middle stratum, occupying *two-sevenths* of the phial, consisting of a reddish, cream-coloured, opaque fluid, containing a very large quantity of the white corpuscles; the third and highest stratum, in bulk amounting to one-seventh of the whole, and consisting of reddish, nearly transparent serum.

The specific gravity of the blood was 1044.

The proportion of fibrin 4·2 per 1000.

On agitating the middle stratum with sulphuric ether, a considerable amount of fatty matter was separated.

The *white* corpuscles varied in diameter, from about $\frac{1}{1800}$th to $\frac{1}{4000}$th of an English inch; the mean of 20 measurements was about $\frac{1}{2700}$th. On the addition of acetic acid, all were seen to be distinctly nucleated; some nuclei were single and globular; others double or triple; most were bent and irregular. The diameter of the nuclei varied between $\frac{1}{3500}$th and $\frac{1}{7000}$th of an inch.

The *red* corpuscles had an average breadth of $\frac{1}{3500}$th of an inch. They were, however, very irregular in size, some, which were carefully measured, not exceeding $\frac{1}{10000}$th of an inch in diameter.

W. ROBERTSON.

EXPLANATION OF THE PLATES.

PLATE I. represents the remarkable coagula of the blood everywhere observable within the vessels in Case I., described pp. 8 and 9.

Fig. 1.—The appearance of the cerebral hemispheres, after removing the dura mater, and exposing the longitudinal sinus.

Fig. 2.—A section of the coagulum in the right auricle.

Fig. 3.—Portion of clot removed from the inferior vena cava.

Fig. 4.—Lower portion of the aorta and vena cava, with their bifurcation into the common iliac arteries and veins, seen from behind, showing the colourless portions of coagulum, even at the most depending portion of the clot, together with the healthy appearance of the venous walls.

PLATE II.—The spleen of Case IV., described pp. 24 and 25, showing the size which this organ may occasionally attain, and the appearance presented on section. The nature of the discoloured portions are said at p. 25 to be unknown; but subsequent investigations have satisfied me, that they are owing to a disintegration of the splenic pulp, which is described at p. 125.

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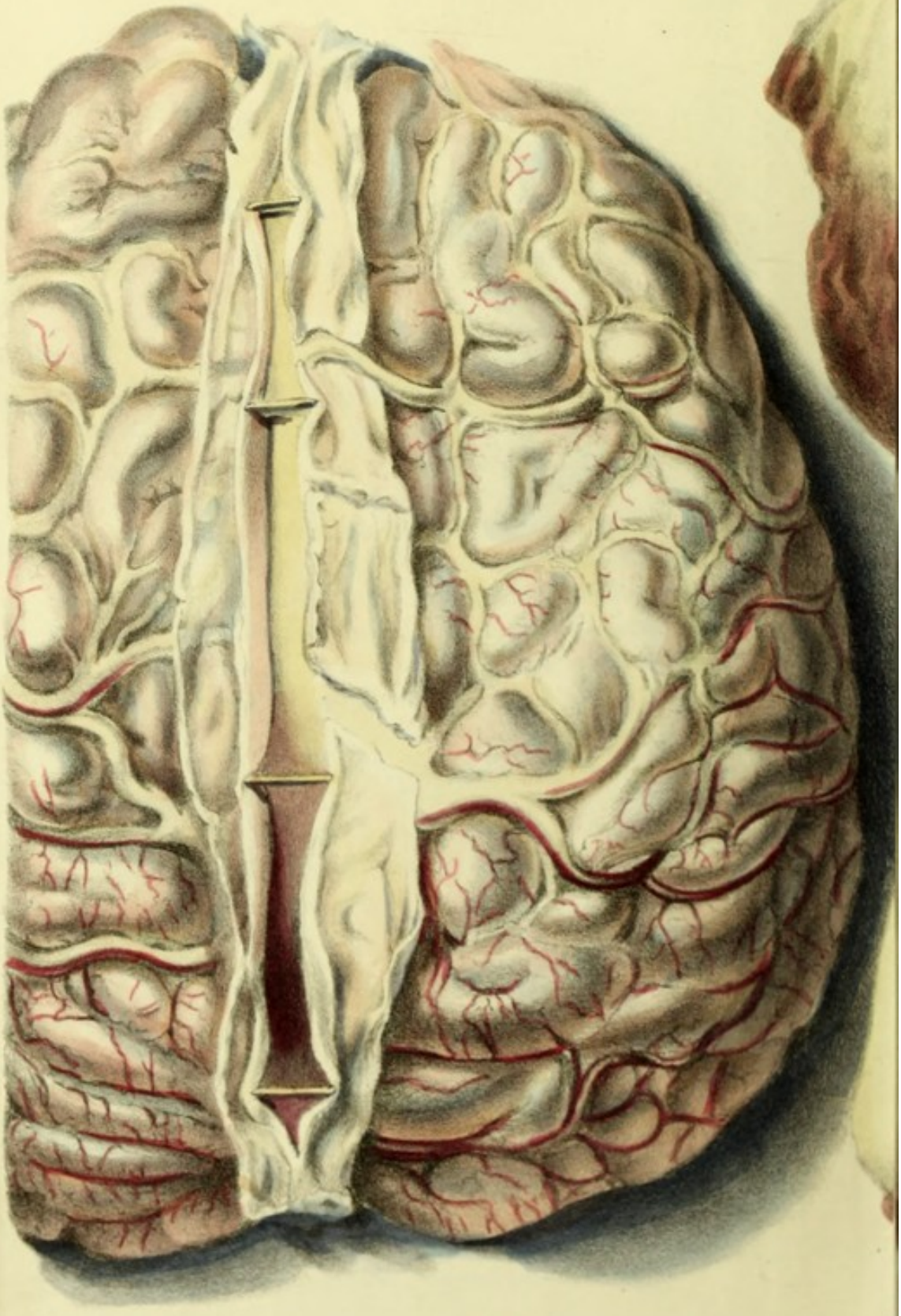
Fig. 1.



Drawn by N. Stewart. 1851.

Fig. 2.

Fig. 4.

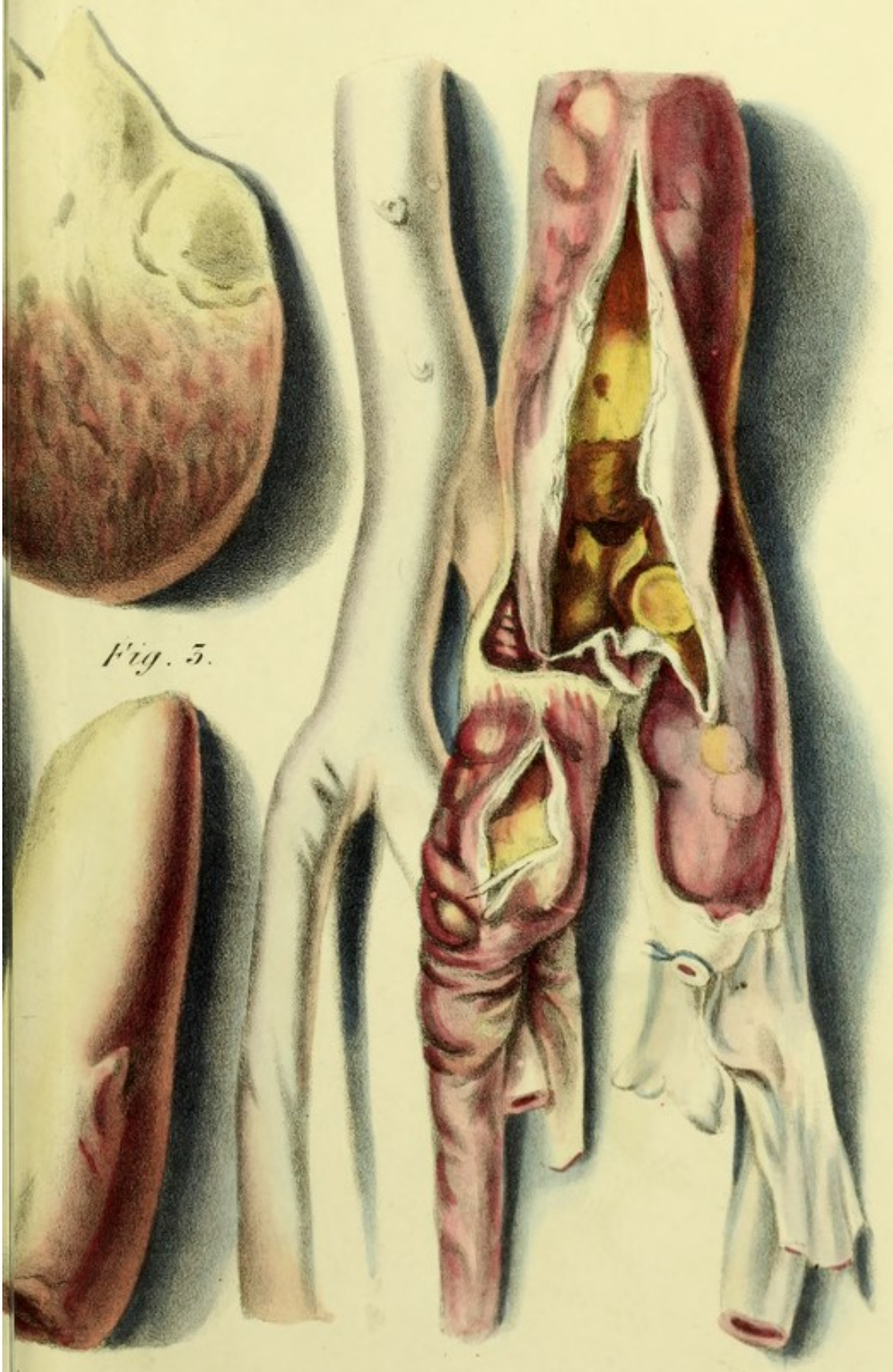
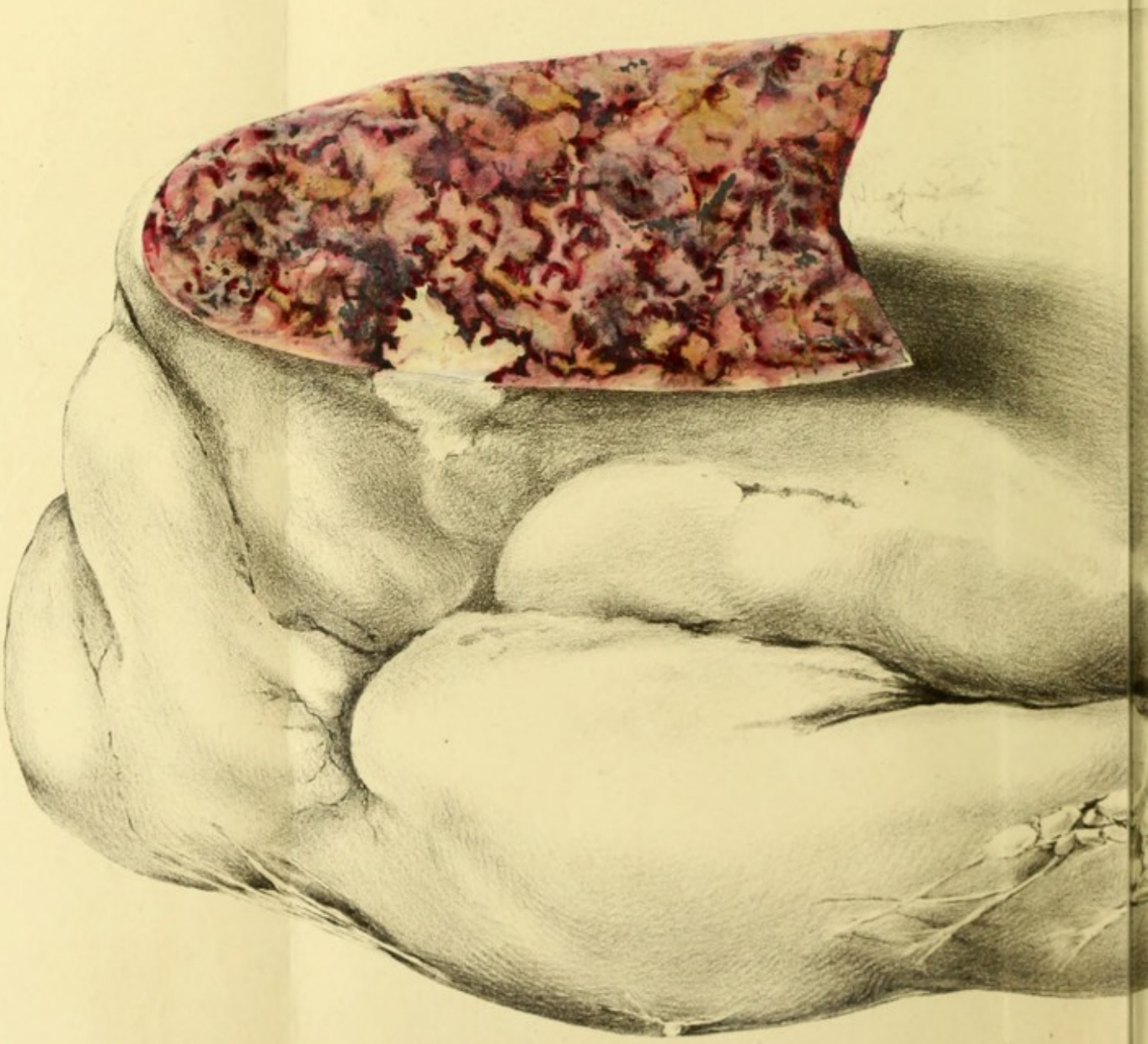
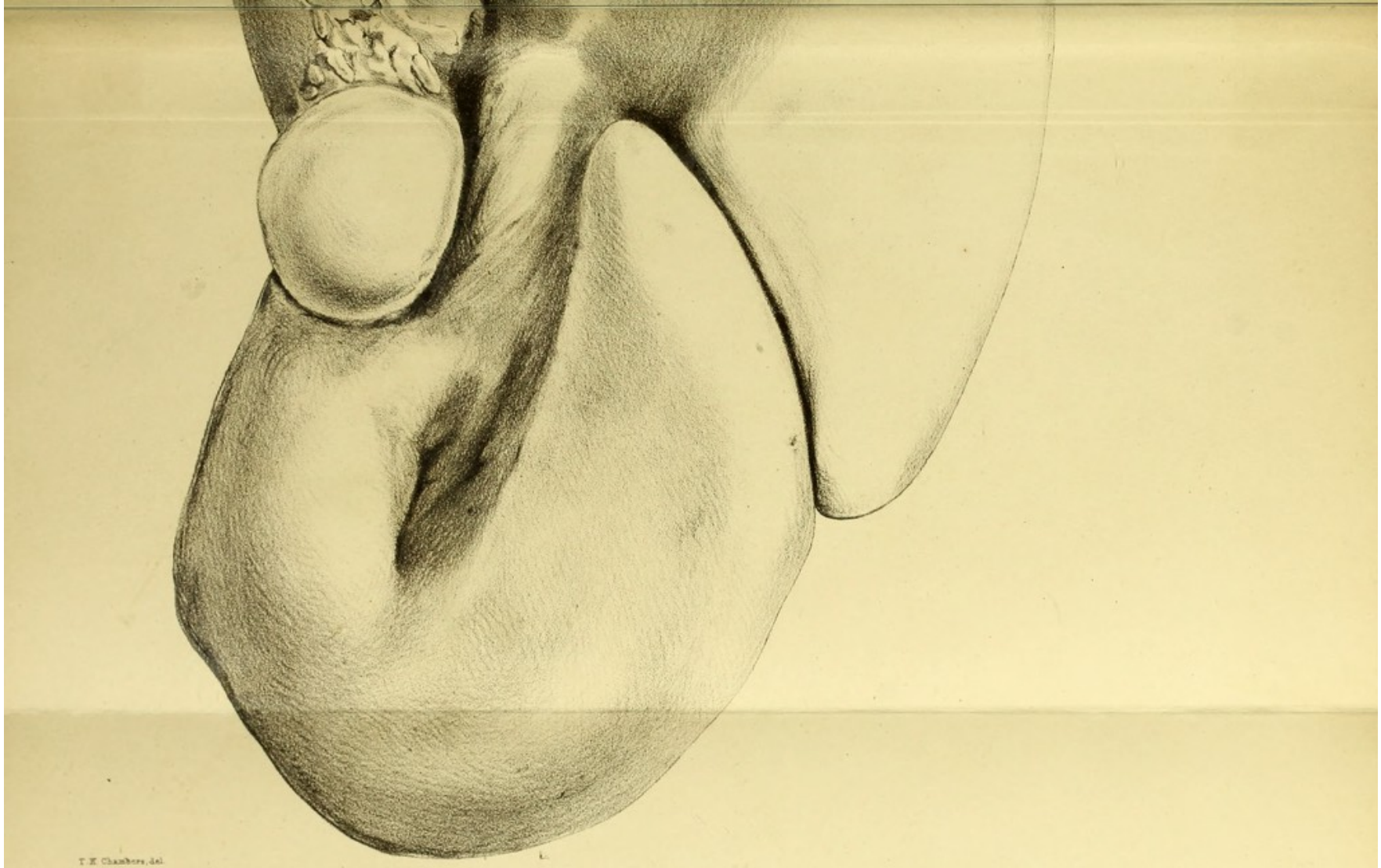


Fig. 3.

Lithog. by J. Gellatly Edin.





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