ART. VII.—*On Chromidrosis*.—Thesis for Degree of Doctor Medicine, Trin. Coll., Dub. Read before the College of Physicians. By ARTHUR WYNNE FOOT, M.D.

THE term chromidrosis (χρᾶσμα, pigmentum; ἰδρώς, sudor) is applicable to those conditions of the perspiration in which it assumes a colour—red, yellow, green, blue, or black. There are reasons for believing that all the pathological pigments which appear in this secretion owe their tints to modifications of the colouring matter of the blood, which colouring matter is being continually set free by the disintegration of the blood corpuscles; and being itself of a very indestructible nature, but at the same time capable of undergoing many chromatic alterations, it may, under peculiar circumstances, appear on the surface of the body, and impart very various tints to the cutaneous exhalations. The term chromidrosis is strictly to be confined to the transudation of colouring matter alone, without any of the cellular constituents of the blood, for, from the nature of the capillary wall, which is absolutely homogeneous and continuous as a film of collodion, it is not possible that particles so large as the blood globules could pass through without a lesion of the vascular membrane; when a lesion does occur from internal congestion or external violence the blood will appear on the surface of the body as a hemorrhage or as an extravasation, but not as a secretion. Therefore to qualify any coloured secretion appearing on the surface of the body for the title of chromidrosis it is necessary that microscopic examination should detect no constituent which would involve a rupture, or compromise the integrity of the capillary wall. The presence of crystals of urea, ("On Urea on the Skin and Uremia," translated by William D. Moore, M.D., *Med. Press*, May 3, 1865, p. 419) of chloride of sodium (Prout, in *Lond. Med. Gaz.*, Vol. XV., October 1834), or of urate of soda on the skin presents no difficulty on account of their solubility previous to excretion.

The integrity of the capillary wall must be particularly insisted upon in considering the red form of chromidrosis, and the test of that integrity will be the presence or absence of the red corpuscles; this test excludes many of the cases of the so-called *sudor cruentus*, all the cutaneous hemorrhages which supplement menstruation, and those which are due to the hemorrhagic diathesis and to purpura; it will also be found a useful help in detecting deception.

The red sweating then will become a more rare phenomenon than might have at first appeared, and the only trustworthy cases of it which I have been able to find are those of Landerer, an Athenian chemist (Buchner's *Report*, Second Ser., Vol. V., p. 234), and Heller, of Vienna (Thudichum *On the Urine*, p. 321). They observed it in the axillæ of fever patients; the condition of the blood in fever, it will be remembered, is one most favourable to the transudation of the colouring matter; under the influence of fever poison the blood cells, possessing little durability at any time, are peculiarly prone to disintegration, the blood is found unnaturally fluid, the red corpuscles loosely aggregated, in amorphous heaps, crenate, and mis-shapen, as if undergoing solution (Murchison, *Treatise on Continued Fevers*, p. 238). Landerer considered the red sweat to derive its colour from the urine pigment, which is so closely related to hematin that Parkes (*On Urine*, p. 30) thinks it is not going too far to assume the amount of urine pigment to be a measure of the metamorphosis of the blood cells; it appears in the fiery red pigment of febrile urine, and its excess in the renal secretion seems to indicate rapid alteration of hematin.

There can be no doubt that blood appears most unexpectedly on the apparently unbroken surface of the body, and it will be useful to contrast two well-marked cases of cutaneous hemorrhage with the coloured sweatings, to show that they have no analogy to the physical process by which perspiration passes to the outside of the body. In 1863 Franque, under the title of hemorrhagic sweat, published the case of a female, aged forty-five, whose catamenia were regular, but who had three times bled from the skin after long continued and severe convulsions, brought on by mental emotion. On a fourth occasion Franque himself was present; the patient had suffered for four days previously most violent pricking pains along the vertebral column, in the left ear, the forehead, the left arm; after the convulsions had lasted an hour, there broke out all over the body a copious sweat, which appeared red at the parts which had been the seat of pain. It derived its colour from actual blood, containing red globules. The convulsions then gradually subsided. As the skin appeared unbroken Franque presumed that the hemorrhage took place from the sudoriparous glands (*Syd. Soc. Year Book*, 1864, p. 179). In 1857 Huss, of Stockholm (*Archiv. Gen. de Méd.*, 1857, p. 165) published a case of spontaneous hemorrhage from the skin, without excoriation of the epidermis, which came

under his notice in the Seraphim Hospital. The seats of the hemorrhage were nearly all hairy—the scalp, the axilla, the pubis, the edges of the eyelids—and were all on one side of the body except the right ear; the exuded blood was of arterial colour, and had all the physical and microscopical characters of healthy blood. The exudation occurred at various intervals of time, and lasted for various lengths of time; it was generally provoked by mental emotion, but appeared independently of that cause; it had no connexion with menstruation, and paralysis of motion and sensation in both extremities of the left side followed the attack. The explanation offered by Prof. Retzuis was a temporary spasm on the venous side of the capillaries, the course of the blood being thereby partially intercepted; the pressure of the blood coming from the heart and arteries against the points where the circulation was intercepted occasioned a lesion in the capillary vessels or the finest twigs of the arteries, and the hemorrhage ensued. Vicarious menstruation was not concerned in the production of the phenomena in these cases, because in both the uterine functions were regular; and observations of Cruveilhier (*Anat. Path.*, Vol. IV., p. 201) show that cutaneous hemorrhages may exist with normal or even with profuse menstruation.

In 1842 Dr. Todd (*Dub. Med. Jour.*, Vol. XXII., p. 12) examined the opinion that hemorrhage might occur by a sweating of the blood through the coats of the vessels, without rupture; and the results of his examination were, that from microscopic investigation of the diameter of the blood cells, he was led to deny the possibility of the escape of blood, in an unaltered state, through the walls of the capillaries, and to assert that all hemorrhages take place by rupture of blood vessels. On this subject Virchow (*Cell. Path.*, p. 113) has more recently spoken in terms of the most positive certainty, and confirms the opinion of Dr. Todd, that a transudation or diapedesis of the blood through its limiting membranes, without rupture, cannot for an instant be admitted; and although we may not, in every individual case, be able to point out the exact site of the lesion, he believes it so inconceivable that the blood, with its corpuscles, should be able to pass through the walls in any other way than through a hole in them, that he declares the subject to be one on which discussion is inadmissible.

In cases of jaundice yellow perspiration has been observed. From the researches of Valentiner and Kerner the colouring matter of the bile seems to be identical with that of the blood.

The colouration of the secretion of the skin in jaundice is not to be received as an evidence of the most intense impregnation of the blood with bile-pigment, because Cheyne (*Dub. Hosp. Reports*, Vol. III., p. 269) observed this phenomenon when the indisposition was so slight, that until his patient's linen was found to have acquired a saffron colour there had been no intention of seeking medical advice. Chomel (*Académie des Sciences*, 1737, p. 69) was acquainted with this symptom, and Andral (*Clinique Médicale*, Tom. II., p. 373) describes a case in which the sweat coloured the linen yellow, and the urine contained the colouring matter of bile, although the skin and conjunctivæ exhibited no jaundiced tint. On the other hand, it is remarkable that when every other secretion of the body has a bilious tint, and the solid tissues are deeply stained, the perspiration will remain uncoloured. The colouring matter in cases of yellow perspiration due to icterus, is pretty well ascertained to be caused by cholepyrrhin, the pigment of the bile. Breschet (*Jour. de Magendie*, Tom. I., Paris, 1821) was the first to adduce arguments in support of the derivation of this pigment from the blood. Virchow's investigations upon pathological pigments have proved that under certain circumstances a yellow substance is formed from hematine, which in its relation to solvents and reagents, bears a close resemblance to cholepyrrhin; and the researches of Funke would appear to indicate the possibility of a direct transformation of hematine into cholepyrrhin. These hypotheses may throw light upon the pigmentary changes which are observed in pyemia, chloroform-narcosis, and after the bites of some venomous serpents, if it be admitted that there may be a conversion into yellow pigment of the hematine liberated from the dissolving cells of the liquified blood. In the removal of yellow pigment from the blood by perspiration, the relation between the duties of the skin and renal organs is well exemplified. Next to the kidneys, the sudoriparous glands take the most active part in its elimination, although the quantity of colouring matter which they excrete is always very inconsiderable in comparison with that thrown by the kidneys. The bile-pigment makes its appearance in the renal secretion sooner than it does upon the skin, and serous effusions in the various cavities of the body become tinged even earlier than the urine. The sudoriparous glands do not undergo any important changes of structure in yellow sweating—their contents appear of a yellowish tinge, but are not the seat of much pigmental deposition (Frerichs' *Diseases of the Liver*, Vol. I., p. 103). The cutaneous secretion

has been observed of a yellow colour during the exhibition of rhubarb. The brown and red resins contained in this drug have been shown by Schösslerger to be the principles in it which communicate to the urine and perspiration a yellow or red colour, according to the alkaline or acid states of these secretions. Yellow perspiration has also been noticed after the long-continued use of saffron, from the absorption of the colouring matter of the stigmata of that plant. I have not been able to meet with any observation on the effect of santonine upon the perspiration; but this white crystalline substance, which is rendered yellow by sunlight, and is transformed by the alkalis of the blood into coloured modifications, sometimes gives rise to xanthops, a phenomenon also observed in jaundice.

The bile contains two colourless resinous acids, the cholic and choleic acids of Strecker, corresponding to the glycocholic and taurocholic of Lehmann, which can be converted in the laboratory, by the action of acids, into a colour-producing substance called chromogen by Frerichs (*op. cit.*, p. 91). The same colour-producing substance is formed in the living body after the injection into the blood of the colourless biliary acids. The chromogen formed experimentally outside the body will, by simple exposure to the air, or more rapidly by the addition of NO_5 , exhibit alterations of tints corresponding in every respect with the colouring matter of the bile, cholepyrrhin, a substance rich in carbon. In the cases where chromogen is formed after the injection of colourless bile into the living body the oxygen derived from respiration is referred to for the development of colour. It is known that none of the elements of the bile, except the colouring matter, can be found in the body even in cases of intense and universal jaundice. This conversion of the colourless biliary acids into a colour-producing substance seems analogous to what is observed after the administration of santonine, and may find a parallel in the conversion of white indigo into blue indigo. Several years ago Heller, of Vienna (*Archiv. für Path. Chemie*, 1853, p. 121), announced that there exists in many urines, both normal and morbid, a substance, itself colourless or nearly so, which gives rise by internal changes to several pigments; the urines in which it occurs are often pale, and poor in normal pigment, but generally very acid. He called this colourless substance uroxanthine. From the difficulty of isolation the exact nature of this substance was not understood till recently. Dr. Schunck, of Manchester, in examining some urines, observed in them a substance

identical with a body also discovered by him in his investigations upon indigo, and which he had named vegetable indican. There appears great reason to believe that this substance, which he called vegetable indican, is the same as Heller's uroxanthine (Parkes *On Urine*, p. 196). This indican, when treated with acids, yields six insoluble pigments, of which indigo-blue and indigo-red are the chief; and some soluble substances, such as sugar and leucine, which it will be recollected are also found in the liver. Heller's uroxanthine also, when acted on by acids, and even by simple exposure to the air, very easily yields a blue colouring matter, which he called uroglauclin, and which appears as similar to indigo-blue as the colourless uroxanthine was to white indigo. These statements point to a strong analogy between animal starch and vegetable starch, and between animal sugar and vegetable sugar. The connexion between hematine and the ordinary urine pigment is generally accepted; the connexion between hematine and biliary pigment is very probable; one of the effects of acids upon a resinous acid of the bile from which its pigment is obtained, is similar to what is observed by the oxidation of uroxanthine. Glycocholic acid, when acted on by SO_3 , has the property, upon exposure to the air, of forming gorgeously-coloured combinations. If the amorphous colourless mass resulting from the action of sulphuric acid upon this white resinous biliary acid, is placed upon a piece of filtering paper, it dissolves, and there is produced a ruby-red spot, which soon presents a blue margin, and after a short time assumes an indigo-blue colour (Frerichs, *op. cit.*, p. 90, note).

Leaving now the red and yellow perspirations, the way is partially cleared for the consideration of the next form of chromidrosis, or coloured sweating—that in which the cutaneous secretion is tinged blue. It will be impossible to avoid taking account of the occurrence of blue pigment in other secretions, such as the urine, the milk, and in suppuration. Dr. Purdon, of Belfast (*Dub. Quart. Jour.*, Vol. II., p. 445), has published the case of a woman, aged forty, who, suffering much from cardiac anasarca, became subject to a clear serous discharge from the trunk and limbs, so abundant as literally to wet her bed; this serous discharge occasionally ceased, and at such times the œdema and dyspnea were very much aggravated; after some time the discharge changed very much in its character, being nearly alternately blue and straw-coloured, or yellow, almost like pure bile. She was made aware of the advent of the blue discharge by a mouldy smell and prickly sensation

which invariably preceded it for twelve hours; the yellow discharge was not attended by either of these premonitory phenomena. The blue discharge always appeared along the posterior part of the chest, the yellow generally proceeded from the abdomen and back of the neck, and rarely from the back; the blue never appeared on the abdomen; the two colours were sometimes procured from the different parts at the same time; the discharge from the extremities was never coloured. The yellow colour was tolerably permanent, the blue faded; she had not taken any preparation of iodine for some years; in place of the catamenia there was a discharge of a reddish-green colour. Dr. Gibb (*Brit. Am. Jour. Science*, N.S., Vol. VI., p. 201, 1850-1) has collected ten cases of blue suppuration, including two observed in Dublin; in one of these cases, which was communicated to the College of Physicians by Dr. Croker (*Dub. Med. Jour.*, Vol. II., p. 367) the dark blue stain imparted to lint was examined by Dr. Apjohn, who pronounced that it was *not* Prussian blue, as had been previously believed. The subject from whom this coloured pus was obtained suffered from a morbidly increased secretion of gastric acid, so much so that her throat, fauces, and tongue were excoriated in vomiting; the suppuration which was set up in the track of a seton assumed an inky dark-blue colour, which Dr. Apjohn concluded was the result of the action of muriatic acid on the purulent matter. This case recalls to mind the observation of Heller, that his colourless uroxanthine normally present in urine, and probably derivable from hematin, was converted by the action of acids into the blue pigment uroglauclin. In 1860 M. Fordas (*Jour de Chimie Méd.*, Tome IX., 1863, p. 577) laid before the Academie des Sciences his researches upon the colouring matter of blue suppurations which he had succeeded in isolating, after great trouble, in a crystallized form, and which he proposed to call pyocyanine. The pyocyanine presented itself in the form of blue prismatic crystals grouped in various ways, sometimes in the form of a cross or rosette, sometimes as long needles tied in bundles or radiating in different directions from one point. The appearances of Heller's crystals of uroglaucline are precisely similar (*On the Urine*, Vogel and Newbauer, p. 45). After having isolated pyocyanine he continued his observations on two most protracted cases of blue suppuration in the Charité Hospital, under M. Velpeau, and, in addition to pyocyanine, has obtained also a yellow colouring matter, which he calls pyoxanthose. This discovery of a blue and yellow

colouring matter in suppuration may throw some light on the simultaneous discharge of the two pigments in Dr. Purdon's case, and a combination of the blue and yellow matter may point towards the explanation of such green colourations as are seen in the pus of cerebral abscesses, in the deranged menstrual secretion, and in conditions of the lochial discharge. Green urine has been seen in Bright's disease, peritonitis, cystitis, and spinal disease; the fluid in eczematous vesicles, at first pale, has been observed to become green by exposure to the air; and in the same case, the urine, slightly green when passed, became much more deeply tinted afterwards (Parkes, *op. cit.*, p. 201).

Blue pigment has been observed in the urine as well as in the perspiration, and in purulent matter; Prout sublimed the blue urinary pigment, and recognized it to be indigo blue. Other observers repeated his experiments, particularly Dr. Hassall, who showed that in many urines the indigo blue could be produced by exposure to the air. Schunck next procured it from the colourless indican, which seems almost identical with Heller's uroxanthine; and the elementary analysis of Kletzensky shows the very closest similarity in theoretical constitution between the two—between indigo blue and uroglaucline, the latter being, with indigo-red, one of the products of oxidation of uroxanthine. Milk, finally, has been found tinged with blue (*Edinb. Vet. Rev.*, 1863, Vol. V., p. 656). The milk of some cows having assumed this colour, M. Mathieu, veterinarian at Sévres, made several experiments to ascertain whether the phenomenon of blue milk depended on the cow or on the dairy. In one case, where a single cow was kept, the milk of which showed this peculiarity, new dishes were employed, and still no amendment took place. M. Mathieu drew milk into two new vessels, and placed them in a dairy; he then drew milk into two glass bottles, stopped them carefully, took them to his residence, six miles distant, and placed them in a chamber, the temperature of which was 15° cent. Three days later blue spots showed themselves on the surface of the cream in the two glass vessels; and after another three days having occasion to visit the dairy where the milk had been set at the same time, he found that it too was covered with blue spots. In another case two cows were kept, one black, the other white, the milk was always mixed, but soon became covered with blue spots, which interfered with its sale. He then caused the milk to be placed separately in two new vessels, drew some

into glass bottles as before, took them home, and placed them in a room different from that of the former experiment. On the fourth day the milk of the white cow was covered with blue spots, while that of the black retained its original colour. These experiments were repeated twenty times, with the same results invariably, from which he concluded that the phenomenon was due to a morbid condition of the secretion in the cow. It is open to consideration whether the blue coloration of the milk was not due to indigo-blue, the result of oxidation of uroxanthine. It is known from Sir H. Marsh's observations that the biliary pigment may simultaneously tinge the urine and the secretion of the human mammary gland; and if one pigment, a yellow one, derived from hematin, may appear in both the renal and lacteal secretions, the same privilege may be accorded to another pigment, a blue one, also connected with hematin.

Dr. Hassall's communication to the Royal Society on the frequent occurrence of indigo in human urine, and on its chemical and physiological relations, was made in 1853. Some of the conclusions which he arrives at are, that indigo-blue is frequently found in human urine, the quantity being subject to the greatest variation; in some cases a pellicle of nearly pure indigo extends over the entire surface of the liquid, while in others it is so small that it can only be detected by means of the microscope. For the formation of this indigo it is in general necessary that the urine should be exposed to the air for some days in an open vessel, oxygen being absorbed, and the blue pigment being developed. Whatever, therefore, facilitates oxygenation, as free exposure to light and air, warmth and sunshine, hastens the appearance of the blue indigo; hence, in Summer the changes described take place much more quickly than in Winter. On the contrary, these changes are retarded, or even stayed, by exclusion of the atmosphere. Blue indigo may even be deprived of its colour, and reformed alternately, according as air is excluded from or admitted to urine containing it. From some of the cases recorded, it would appear, however, that blue indigo is occasionally found in the system, and is voided as such in the urine. There is usually found with the blue indigo, when the amount of this is considerable, a brown extractive, sometimes in large quantity, the aqueous solution of which, by further exposure to the air, yields a further supply of coloured indigo, and which clearly resembles hematin in its chemical manifestations and elementary composition. There is, therefore, great reason for believing that in the majority

of the cases recorded, the blue indigo was derived from altered hematin, although it is at the same time probable that it is in some cases formed from modified urine-pigment, which itself is also regarded as a modification of hematin. Between the greater number of the animal colouring matters there is the closest relationship in chemical composition, so that the transformation of the one into the other would appear to be both easy and natural. Although the exact steps of the conversion of hematin into indigo cannot yet be stated, some hypotheses have been suggested as worthy of mention (Parkes, *op. cit.*, p. 199)—thus, one equivalent of hematin and twenty-two of water will give the elements of two of indigo-blue and one leucin:—

Another formula is, that hematin with water and oxygen will give indigo-blue, benzoic acid, and ammonia:—

Though putting no more faith in these hypothetical reactions than any conjectural formulæ in organic chemistry deserve, yet I think that after considering them we may be in a better position to approach the remaining forms of chromidrosis, which from their local characters and striking peculiarities have always excited much attention. It is a subject of congratulation that we are indebted to the acute observation of Irish physicians for a large proportion of the most remarkable cases of cutaneous secretion of pigment that have been put on record—Dr. Law, Dr. Neligan, and Dr. Banks, in Dublin, and Dr. Purdon and Dr. Reade, in Belfast, have made most valuable communications on this subject.

The case recorded by Dr. Banks was an unmarried female, aged twenty-three, the daughter of a fisherman, and she resided at Skerries, in the County Dublin. She was engaged to be married to a man who was hereditarily predisposed to insanity, and who committed suicide by hanging himself shortly before the time fixed for their marriage. She went to her lover's cottage, and her mother sent her into the room in which he was suspended. She

knew something dreadful had happened, but did not know exactly what it was, until, on rushing into the chamber, she struck suddenly and violently against his lifeless body. She became maniacal, with suicidal propensities, and three months after had to be committed to the Richmond Lunatic Asylum, where, for upwards of two years, her state underwent little or no change. In the meantime she had suffered from deficient menstruation and periodic hemoptyses.

When Dr. Banks first saw this woman his attention was attracted by a remarkable discoloration round the eyes, but chiefly beneath and extending to the side of the nose; and he states the appearance to have exactly resembled what one would imagine to have been produced by painting the part with Indian ink, or perhaps, he says, rather with Prussian blue. The discoloration round the eyes had existed since the cessation of the catamenia, but became of more vivid hue during the continuance of the periodical hemoptyses. She continues still to present this discoloration, but in a slighter degree.

Laycock (*Med. Ch. Rev.*, No. LIV., p. 464) mentions a very similar case in a woman, aged twenty-four, affected with melancholia, and who became the inmate of an asylum. She presented a symmetrical discoloration of the face; but the eyelids, both upper and lower, were, in particular, deeply tinted with pigment. The influence of emotional disturbances of the nervous system in the production of pigments is very strange. The effect of fright upon the colour of some reptiles, as the chameleon and frog, has been shown, by Mr. Lister in a communication to the Royal Society, June, 1857, to be due to the influence of the nerves distributed to the skin.

Another case of blue discoloration was observed by Dr. Billard, in a girl of sixteen, who presented, on the face, neck, and upper part of the chest, a beautiful blue coloration, extending chiefly on the forehead, the *alæ nasi*, and around the mouth. When the face was rubbed with a white cloth, the cloth became stained with the colouring matter, leaving the skin of its natural hue. This girl had menstruated for two years, and there had been no deficiency of this secretion. The blue appearance round the eyes presented itself when she worked in a confined and hot place. At the end of a year the whole forehead and face had become blue, so that the attention of persons who met her was attracted. After the use of certain medicines, an abundant perspiration was observed, and simultaneously a sensible diminution of the urine, and a considerable increase of the blue colour. The intensity of the blue

coloration was influenced by the activity of the perspiration, which stained her linen blue. The blue secretion was submitted to analysis; alcohol and ether easily dissolved it, and evaporation of the solution left a residuum of a blue colour; concentrated HCl produced no change on the stained linen; concentrated NO_5 destroyed the colour; slightly alkaline warm water decolourized the linen; no indication of iron could be detected in it (*Archives Gen. de Med.*, Tome XXVI., p. 453). Again the observation of Heller suggests itself, that in another secretion the urine, in many ways analogous, and also closely correlated to that of the skin, the blue colouring matter, uroglauclin, was produced by simple exposure to the air; from his colourless principle, uroxanthine, and the close connexion of both of these substances in elementary composition to hematine is to be borne in mind. The great richness of the colouring matter of the blood, of uroxanthine, and also of uroglauclin in carbon, may assist in explaining the occurrence of this coloured secretion at catamenial periods. According to Andral and Gavarret the maximum secretion of CO_2 occurs at this period in the female organism; and if the catamenial discharge is to be regarded as a mode of eliminating carbon, and that means of secretion is interrupted, the formation of CO_2 being constant, we will be less surprised to find the skin engaged more actively than usual in the performance of that duty. It may be in this direction we are to look for an explanation of the cutaneous discolorations in gout and rheumatism. I have lately seen all the swollen phalangeal articulations of a gouty subject so dusky a brown as to attract attention at once; the colour was deepened during an intercurrent attack of pericarditis. In seven cases of chronic rheumatism, and cardiac disease of rheumatic origin, Laycock (*Med. Chir. Rev.*, No. LIV., p. 475, 1861) observed pigment deposit on the skin, together with more or less pigment in the blood. His explanation is, that if the supply of oxygen to the system be not sufficient for the transformation of lactic acid, $2\text{HO C}_{12}\text{H}_{10}\text{O}_{10}$, (assuming that the phenomena of rheumatic fever are due to the presence, in excess, of this acid) into carbonic acid and water, and it undergoes no further changes, then it appears in the urine; but if the carbon of the flesh be not oxidised into lactic acid, then it is excreted as colouring matter in some form or other.

The next case which I shall refer to is one of five published by Leroy de Mericourt, which exhibits a transmission from blue to black pigmentation. The subject of what I call the transition-case

was a woman in her twenty-first year, of good constitution, whose catamenia had always been regular, and in sufficient quantity, from the age of seventeen. Without appreciable cause, and three days after the cessation of the catamenial discharge, she perceived that the under eyelids had assumed a *blue* colour, which on the following day became of a deeper tinge, closely resembling Indian ink. The discoloration was not confined to the lower eyelids, but extended a little to the cheeks. The colour was rendered more intense by heat, exertion, emotion, or fatigue, which are also causes promotive of the perspiratory secretion; it persisted during the night, and soon acquired the hue which it retained during the day. When examined under a magnifying glass the colour was found chiefly accumulated in the areolar grooves—the seat of the most marked depots were the folds of the lids. It had the appearance as if the girl had passed some time in an atmosphere charged with coal dust, and had washed her face, except the under eyelids. The colour was due to a multitude of little black grains deposited as an efflorescence on the surface of the skin. On rubbing the abnormally-coloured parts with a white cloth it is stained black; but neither by this nor by washing was it possible to restore the integuments to their ordinary colour—the shade was merely rendered less intense, and soon became as deep as before. This may be explained by the precipitation of part of the pigment in the superficial layers of the true skin, of which we have examples in the precipitation of metallic silver, in a state of minute division, from its soluble salts, after the protracted use of that metal (J. Van Guens, *Archiv. für die Höländischen Beiträge zur Natur und Heilkunde*, 1857, Band I., Heft I. und II., p. 106), and as is seen in the occasional fixation of colouring matter in the skin, observed after exposure to solar light or artificial heat, in the various degrees of sunburn, or the *tâches de brulure* on the legs of old persons who sit much before the fire.

The colouring matter of the skin of the negro is deposited in the deepest and youngest layers of the epithelium; it was removed from the skin and isolated by Beclard, by macerating the skin of the scrotum, which is peculiarly dark in the coloured races; the rete mucosum, in becoming resolved into a kind of mucosity, tinged the water, and allowed an impalpable brown powder to fall to the bottom of the vessel. He believed it to be very similar to the colouring matter of the blood, and quotes the chemical observations of Davy, Coli, and others, as having demonstrated what Blumenbach had long ago advanced, that the pigment of the skin is highly

carbonaceous (Beclard, *Elements of Gen. Anat.*, trans. by Knox, p. 146).

Le Cat, a surgeon at Rouen, examined chemically the colouring matter of the cuttle-ink, and showed its identity with that of the skin of the negro and of the choroid coat of the eye. The conversion of hematin into pigment seems to be effected by the influence of agents addressed sometimes to the hematin itself, sometimes to the iron it contains. Rokitsansky cites the effects of strong mineral acids, as the sulphuric, which, introduced from without, darken and blacken the blood with which they come in contact. Carbonic acid gas (evolved, along with carbonic oxide gas, out of glowing charcoal) acts in the same manner upon the capillaries when a stream of it traverses the fauces, and a similar influence is exercised by acid secretions generated in the organism itself, as was seen in the case above referred to, and observed by Dr. Croker, and in the coloured softening of the stomach. The frequent conversion of red hemorrhagic exudates upon the peritoneum into black strata is most probably founded upon the influence of the intestinal gases upon the hematin. In common with ammoniacal gas it is principally the sulphuretted hydrogen of the bowel which, acting by exosmosis upon the iron of the hematin, enters with it into a black combination, namely, sulphuret of iron (*Pathological Anatomy*, Vol. I., p. 211).

In 1802, Dr. Marcet (*Med. Chir. Trans.*, Vol. XII., p. 37) saw a young woman who was subject to attacks of cutaneous discoloration; the colour was black or dark *purple*; the toes, legs, hips, and face were in succession liable to these attacks. The cutaneous affection usually began with a tingling of the parts, soon followed by a considerable swelling or puffiness over an extent of several inches, which lasted for some hours, and was ultimately followed by the appearance of the pigment. Her urine acquired a black colour during daily paroxysms partaking both of the febrile and hysterical character. This black urine was not investigated at the time by Dr. Marcet, but twelve years afterwards he observed this curious phenomenon, black urine, in a subject who certainly would not be accused of any hysterical disposition, at least in the ordinary sense of the word. This black urine was passed by a healthy male infant of seventeen months. Almost immediately after its birth it was observed that the child's urine tinged his napkins of a dark purple hue, which alarmed his parents very much at first; but as the infant's health remained perfect the alarm subsided, although

this peculiarity never abated for any length of time. When the child had reached the age of about nine months, and when the urine could be more easily collected, it was found that, though perfectly clear on being first discharged, it assumed in a very short time a dark colour, somewhat like that of port wine, which became darker by standing; it was then quite black and opaque, without any sediment or turbidness; on the surface, when examined in a strong light, a dark purplish hue was discernible, giving the liquid the appearance of a strong solution of liquorice. There were occasional variations in the degree of coloration, and it sometimes even totally disappeared; it was observed to prevail in the greatest degree when the child's bowels were confined. A specimen of this urine, quite clear when passed, sp. gr. 1022, was at the end of two days quite black, had an ammoniacal smell, and was sensibly alkaline; after an interval of six weeks it remained precisely in the same state, and after a lapse of seven years was still perfectly unaltered, having preserved its colour, having deposited no sediment, and possessing the same ammoniacal pungency, without any distinct urinous smell. No red globules could be detected in it, in a microscopic examination of it made by Dr. Wollaston; no iron was detected in the black deliquescent residuum left on evaporation.

This urine was further examined by Dr. Prout; the addition of dilute acids produced no immediate change of colour in it, but after standing some time a black precipitate slowly subsided, leaving the supernatant fluid transparent and but slightly coloured.

Schilling mentions the case of an infant, with previous hyperemia of the skin, whose entire surface was covered with a lamp-black matter, which came off with the linen (*De Malanosi*, p. 32. 1831).

The remarkable drawing which I hold in my hand is the portrait of a young lady, fifteen years of age, by whom black matter was voided in the urine and feces, by vomiting, and also appeared on the face. The right half of the forehead represents the discoloration of two days' duration, and the opposite side of five, showing the difference in quantity of the black matter secreted during the longer interval. She was a patient of Dr. Read, of Belfast, and, having been brought to London, her case attracted so much notice that it was communicated to the Medico-Chirurgical Society by Sir B. Brodie (*Med. Chir. Trans.*, Vol. XXVIII., p. 611. 1845). The discoloration commenced on the left under eyelid, near the internal angle of the eye, appearing at the commencement as a brownish spot, which in the course of four or five days assumed a

jet black colour, and gradually extended to the entire forehead and eyelids of both eyes. The discoloration never appeared on any other part of the body, and on the forehead was accurately limited by the hair. Attempts to wash the black matter off caused so much pain, from the sensitiveness of the skin, that she discontinued to do so. The quantity of black matter removed on one occasion by soap and water was sufficient to darken four basins of water as black as Indian ink. Some letters of this lady's father to Dr. Read show the state of perplexity her medical attendants were in to account for the phenomenon:—"They were so much at a loss," writes her father, "that they fell into a curious mode of solving their doubts, and declared the child had rubbed some black stuff upon her own face, for some causes to them (and to me, I declare) unknown. This took such firm hold of their minds that, having met, they called for warm water and soap, with which they certainly removed all appearances of blackness from her countenance, leaving the skin perfectly smooth and unruffled. This operation, you may well imagine, only tended to confirm them in their strange opinions, and I had to sit one whole day watching her most narrowly, and locked her up at night by herself, before they would believe that some imposition had not been practised. However the discoloration returned in the course of five or six hours; and, fortunately for the sake of the poor child's character, it came on gradually, in the presence of Major Greenwood and several others, while we sat at the dinner-table." On a subsequent occasion her father writes:—"The medical men still entertain the supposition of a trick—at least they were so sceptical that one of them came on Monday last, and, after washing all traces of it off from her face, remained with her eight hours, when, from his own observation, he was satisfied it proceeded from natural causes; and thus, I trust, all these non-sensical doubts are for ever set at rest."—(*Dub. Med. Press*, Vol. XV., p. 204).

It is admitted by Mr. Teevan that this patient had no tendency whatever to hysteria; the catamenia were regular, though scanty; during the period when the black matter was ejected from the stomach, bowels, and kidneys, there was a cessation of its secretion by the cutaneous exhalents of the forehead. Examination of the black matter from the face was made by Dr. Owen Rees, who reported it as composed of carbon, iron (in some unknown form of combination), lime, animal matter (albuminous), fatty matter, alkaline phosphate, and chloride. It was insoluble in water, it

yielded fatty matter to alcohol; the black colour was not changed by the action either of caustic potash or strong nitric acid. When moistened with distilled water it reddened litmus paper. Under the microscope was seen a confused mass, apparently made up of short hairs, epithelial scales, granules, and globules of fat. The black matter vomited was very acid; the carbon from the face was so finely divided that it burned with a vivid combustion, almost having the appearance of deflagration. Carbon, he continues, is certainly the colouring matter of this material (*op cit.*, p. 618). The lady became perfectly cured of this complaint. Dr. Neligan made a communication to the College of Physicians ten years ago on a "Peculiar Black Discoloration of the Skin of the Face" (*Dub. Quart. Jour.*, Vol. XIX., p. 293), which he had seen in a patient of Dr. Quinan's, and a drawing of whom I have in my hand. She was twenty-one years of age, the catamenia were suppressed; and after having for some time suffered from irritability of stomach and periodic vomiting, a dark bluish-black stain appeared at the inner canthus of the left eye, and soon both under eye-lids were discolored, the dark patches extending and becoming of a deeper colour at each catamenial period, the skin was so excessively tender at the seat of the discoloration that she could not bear the most gentle pressure with the finger on the parts, and she would not allow the removal of the colour by washing; the black discoloration subsequently extended very much over the face, engaging both cheeks to below the malar bones, and also the alæ of the nostrils. On examining the dark patches with a powerful lens, Dr. Neligan observed that the stain was dotted over the surface of the skin, the dots corresponding to the orifices of the sebaceous glands, and for this reason he approves of the term *steorrhœa nigricans* for this affection. He considered that, as not unfrequently occurs in females in whom the menstrual function is deranged, the secretion of the sebaceous glands becomes augmented in quantity, and that in these special cases it is further more altered by being stained with the colouring matter of the blood. Dr. Law suggested (*op. cit.*, p. 300) the name *blepharo-melena*, with reference to the case of a patient of his who suffered from a dark areola round the eyes, which subjected her to much persecution and annoyance when living as governess in the family of a homeopathic physician, who, notwithstanding the written testimony of Dr. Law and Sir H. Marsh to the genuineness of the phenomenon, persisted in accusing her of imposition and deceit. In the *Mémoires de l'Académie*

Impériale de Médecine (Tome XVII., XVIII., 1853-4) is a case of black coloration of the face observed by M. Bosquet, in the person of a married woman, heretofore in good health. Upon the subsidence of a violent paroxysmal cough she found her face gradually assuming a darker and darker colour, until it looked as if smeared with a "thick solution of indigo." The colour afterwards became still deeper, until her face resembled that of a negro under slight transpiration. By washing, the black layer could be removed, the skin then presenting a bluish-black colour, as the chin of a person having a strong black beard does after shaving. After a while small drops of black fluid appeared at the surface, and forming into a compact layer, gave the same appearance as before. Linen coming in contact with the face acquired stains that repeated washing only effaced. The colour, which had commenced towards the end of August, had quite disappeared by the middle of December, the only symptom noticed during its persistence was severe headache. With reference to this flux of facial pigment the question arises whether its appearance on the free surface of the skin is in accordance with the physical law of exosmosis, which the ordinary cutaneous secretion obeys, or whether it is the result of a capillary rupture; there are grounds for believing that the black, blue, or bluish-black colouring matter is a secretion from the capillary vessels of the skin; especially those of the sudoriparous glandular coil, because it is not observed that blood cells are present, or any structural constituent which would violate the integrity of the vascular membrane, and from the fact that in the cognate secretion, the urine, there is a recognized soluble principle, colourless at first, which can afterwards become blue or black, and then admits of precipitation and collection; there are also cases in which the dark pigment exists preformed in the blood, as in the cases of melanemia observed to accompany enlargement and pigmentous deposits in the spleen (Virchow, *Cell. Path.*, p. 222).

Laycock believes that the morbid pigment deposits proper, as distinguished from masses of altered blood corpuscles, are carbonaceous excretions, and are often vicarious with the suspension or imperfect elimination of other carbonaceous excretions—as the carbonic and lactic acids, and the pigment constituents of the urine and the bile; he properly draws a distinction between carbonaceous secretion and carbonaceous deposit, the examples of fixation of

carbon on the surface of the body are much more numerous than of its excretion as a dark pigment.

The secretion of colouring matter on the face is almost peculiar to females; in its commencement it is to be distinguished from the venous lividity of the lower eyelids observed during menstruation, and from the blueish hue derived from the circulation of imperfectly aërated blood. Its preference for the face, if not connected with the free and full exposure of that part of the body to light, heat, and air, great colour-developing agencies, may be referred to that law of selection which leads to the pigmentation of the mammary areola in pregnancy, or even in ovarian disease without pregnancy, and to the formation of the dusky abdominal streak observed under the same circumstances. These cutaneous pigmentations—the utero-ovarian melasma of Laycock—are so constant in pregnancy as to become diagnostic of that condition, but they are not confined always to the same part of the body. Montgomery^b (p. 283) alludes to a lady of rank, who, when pregnant, was much annoyed by the appearance on her forehead and nose of two streaks, exactly resembling the marks that would be made by very dirty fingers drawn along these parts; another lady in her first pregnancy observed brownish spots on the sides of the forehead and temples, which she at first mistook for accidental soils on the skin; they remained permanent; further pregnancies made additions to them, so that at last she was obliged to dress her hair in a particular manner to conceal them. Le Cat and Camper have observed the face become quite black in pregnancy. Discoloration of the lower eyelid has been observed in men; Laycock (*Med. Ch. Rev.*, No. LIV., p. 467) remarks that this blepharal melasma, as he calls it, usually commences on the inner margin of the lower eyelid, and extends like a daub of Indian ink from thence to the middle of the lid; he observed it most commonly in men with dusky complexions, of enfeebled health, and nervously disposed; though it is not easy to see how far it is in relation with the genito-urinary system, he thinks it was so in the three or four cases he noticed. The actual transudation of the pigment from the blood vessels seems to be dependent upon conditions of the vaso-motor nerves; the generally symmetrical nature of the deposit, the absence of local disease of the skin, the great hyperæsthesia of the seat of coloration, all point to lesions of the innervation of the integument, causing local

^b Signs and Symptoms of Pregnancy.

determinations of blood and local variations of vascular action. Dr. Neligan has expressed his opinion that this colouring matter is derivable from hematin; Professor Laycock is in favour of its carbonaceous origin. In conclusion, I am anxious to direct attention to the connexion between many anomalous appearances of colour in various secretions and the formation of indigo compounds; from the facts that the coloured exudation on the skin has been in several cases blue all the time it continued, in others blue at first and becoming black, perhaps only from intensification of the original colour, that we are not acquainted with any blue form of carbon, and that there is a colourless substance normally present in the urine, from which indigo blue is produced by mere exposure to the air.

ART. VIII.—*Clinical Reports of Rare Cases, occurring in the Whitworth and Hardwicke Hospitals.* By SAMUEL GORDON, M.B., F.K. & Q.C.P.; Physician to the Hospitals, and Lecturer on the Practice of Medicine in the Carmichael School of Medicine.

(Continued from Vol. xxxiii., page 356.)

Most Extensive Pleuritic Effusion Rapidly Becoming Purulent; Paracentesis; Introduction of a Drainage Tube; Recovery; Examination of Interior of Pleura by the Endoscope.—I do not propose entering upon the history or details of the operation of *paracentesis thoracis* and the introduction of drainage tubes, but simply to record another case of recovery by this mode of treatment, and which has taken place under very adverse circumstances. I am induced to do so because I believe that this mode of treatment, originated by Dr. Goodfellow, of the Middlesex Hospital, has not met with sufficient favour on this side of the Channel.

In this city Professor Banks, Dr. Kidd, and myself have from time to time laid before the profession cases in which it has proved successful, and what is of more importance, cases whose recovery we would have despaired of if they had not been so treated.

It is not long since I had under my care a boy, about fourteen years of age, son of a physician of considerable repute in his own district. This boy upon recovering from a very severe attack of malignant scarlatina, was seized with acute pleuritic inflammation of the left side, with effusion of purulent matter to a large amount;