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PIGMENTATION OF FACE AND OTHER PARTS, ESPECIALLY IN WOMEN.

BY

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The frequency with which pigmentation (especially pigmentation of the face) is observed in women, and the especial frequency with which such pigmentation comes under the notice of the obstetric physician is my excuse for a communication on this subject.

The subject of pigment in all its relations is so large, that I shall confine my attention to one very small department, namely, that of pigmentation in the human female, arising more or less rapidly, and remaining or disappearing; and shall allude to other branches of the question only incidentally.

I shall thus only refer, in passing, to the fact pointed out by Lecat (p. 91), that even in the black races the colour is in a sense not congenital, but takes some two or three days to develop itself; that it is most intense at the age of greatest vigour (about 30), and becomes pale again with old age; besides this, it is subject to variation with emotion and disease; and partial or complete congenital or acquired albinism in blacks has been not unfrequently described.

Mr. Darwin (Descent of Man, vol. ii. p. 318) says:—"The new-born negro child is reddish nut-brown, which soon becomes slaty-grey, the black colour being fully developed within a year in the Sudan, but not until three years in Egypt. . . . The children of the Australians immediately after birth are yellowish-brown, and become dark at a later age. Those of the Guaranys of Paraguay are whitish-yellow, but they acquire, in the course of a few weeks, the yellowish-brown tint of their parents. Similar observations have been made in other parts of America."

Pregnancy.—The effects of pregnancy on pigmentation are well known. The pigmentation of the skin over the linea alba from pubes to umbilicus, or even to the ensiform cartilage, pigmentation of the whole of the abdomen, and of the areolæ of the breasts, are all matters of constant observation; it is also well known that the face is liable to be pigmented under this condition.

Other parts of the body may be pigmented in pregnancy. Lecat mentions a lady whose left leg always turned black when she was pregnant (p. 142), and makes a very apposite remark (suggested to him by the authority for this fact), about the connection between this case and the "animaux qui noircissent dans le rut," of which we shall have more to say later on.

Abdominal Tumours.—Pigmentation has frequently been observed in abdominal tumours. I have seen as plainly marked a brown abdominal line in a little girl of nine years old as I have ever seen. In this case there was an abdominal tumour of uncertain nature, not improbably a dermoid ovarian cyst, together with some mammary development.

Menstruation.—Pigmentation is often associated with menstruation, even where this is normal, and still more where it is disordered.

Heusinger remarks that spots of pigment (ephelides) often appear before the catamenia, and that when pre-existing they generally become darker before and lighter after the monthly periods (pp. 50–52).

Again (p. 53), that at the menopause, and in women who have never menstruated, one often sees light yellow, brown, or black spots, especially round the mouth and pudenda.

It is very common to see the menstrual period indicated by dark marks under the eyes, and not uncommon to see the pigmentation extending all round the eye, commensurately with the orbicularis palpebrarum. Part of this may be due to venous lividity, but in most cases it is undoubtedly pigment which causes the colour; and the colour may be permanent, becoming darker at the monthly periods, like the ephelides mentioned above. In many cases the pigment is deposited in situations which put venous lividity out of the question.

Laycock (No. 1) mentions a family of six daughters with permanent pigmentation of the eyelids, which became darker at every menstrual period.

Billard mentions the case of a girl whose forehead, face, neck, chest, and abdomen became discoloured blue as suddenly as the cameleon changes; this, however, was no doubt due to a peculiar vascular rather than pigmentary state.

The close connection between *sexuality* and pigment is seen not only in the association of pigment with pregnancy and menstruation, already alluded to, but also in the darker colour of the parts covered with sexual hair, the axillæ and groins (Laycock), in the fact, mentioned by Lecat, that the scrotum forms an exception to the law that new-born negro children are not black, for that it is black at birth; in the wedding garments of birds, beasts, and fishes, long known, but lately brought prominently and beautifully before us by Mr. Darwin in his "Sexual Selection;" and in the pigmentation of the vulva in some animals (*e.g.*, the Leporidæ) at the time of heat. This connection has been long observed, though not so long applied to man.

Heusinger remarks (p. 21) that eunuchs are generally both fair and fat. This antithesis between fat and pigment will be again alluded to.

Although the pigmentation under the eyes in men following a debauch might strictly be referred here, it probably belongs rather to the head of nervous exhaustion than of sexual excitement.

Age.—The influence of age on pigment is not always the same.

First, it is well known that old and feeble persons frequently become pigmented, and, as above remarked, that patches of pigment occur in women at the menopause.

Secondly, we need only mention gray hair, but have to remark that the cases of sudden blanching from fright (to be hereafter alluded to), and the fact that the colour of negroes becomes lighter in old age, all point to the change being one of pigment rather than of change of texture in the hair.

Lastly, there are rare cases where old people regain the original colour of their hair. Such a case is mentioned by Laycock (No. 1). A weaver, W. Strachan, died at Aberdeen, aged ninety-two. About three years before his death his gray hair became dark again, and at the same time his eyesight, which had been bad, improved very much.

This case is all the more interesting from the recovery of visual coincidently with pigmentary vigour, proving it to be an instance so far of rejuvenescence.

We are hardly prepared, however, to endorse Professor Laycock's analogy of this with the recurrence of "true menstruation" in old age. Cases are, indeed, on record, but unaccompanied by such proofs of the elimination of error as would alone justify their name.

Disease.—The influence of disease on pigmentation is best known in connection with Addison's disease. It is found with many diseases, in those associated with changes in the blood corpuscles observed in cachectic diseases, such as chlorosis, tertiary syphilis, chronic rheumatism, cancer; and in those which are intimately connected with dyscrasis, visceral or glandular diseases,

such as those of the spleen, (*e.g.*, malaria), suprarenal bodies, lymphatic glands, &c. (Laycock).

It is often well marked in exophthalmic bronchocele, the patient having a dark pigmentary ring round the eyes.

Laycock (No. 2) mentions a case of paraplegia in a man where there was asymmetrical pigmentary mottling over both sides of the lower maxilla and over both groins. Each ramus of the jaw was natural, all the surrounding skin being dark. The upper part of each thigh and groin was white, the skin around being dark.

Erasmus Wilson found that in 20 cases the predisposing causes of pigmentation could be stated as follows:—Nervous debility in 13, nutritive debility in 4, assimilative debility in 3. The remote predisposing causes were pregnancy and uterine derangement in 9, nervous shock in 6.

Lecat (p. 96) remarks that "Les maladies extrêmes font pâlir les negres, et quand il leur arrive de se noyer, on les trouve si changés de couleur, qu'on les prendroit presque pour les blancs." On the other hand, "Ce même negre, qui a pâli pendant sa maladie, n'est pas plutôt mort, qu'il redevient plus noir qu'il n'étoit pendant sa vie."

Laycock believes a patch of gray hair to be a sign of a gouty diathesis. In morphœa we have an instance of direct relation between nerve and pigment. With this we shall content ourselves, merely remarking the large share that seems to be taken by the nervous system in these changes; for instance, in such diseases as Addison's disease, exophthalmic goître, paraplegia, malaria, and the list quoted from Professor Erasmus Wilson.

For other references, see Pouchet (*loc. cit.*, No. 2, p. 37).

Nervous Influence.—The influence of the nervous system on pigment is undoubted, and although this has been most conclusively proved from vivisections on animals, the conclusions derived thence are in harmony—*mutatis mutandis*—with what we are able to observe in human beings.

The influence of the emotions is manifold. The most violent emotion being that of terror, we are not surprised to find it answerable for the most striking of the phenomena.

The best-known effect of fright is that of blanching the hair. There are several authentic instances of hair having turned white in a single night under terror or grief. The following case, in which the change was actually observed in progress, is related by Laycock (No. 2, p. 459), on the authority of Staff-Surgeon D. P. Parry of Aldershot.

On February 19, 1858, a rebel sepoy of the Bengal army was brought before the authorities and stripped naked. His hair was glossy black. He was in great terror. Presently the serjeant exclaimed, "He is turning gray!" All present saw his hair turn completely gray in half an hour.

Lecat mentions that great fear turns negroes pale (fait pâlir les Negres).

Heusinger (p. 39, note 2) quotes from "Annales de la Soc. de Méd. Pratique de Montpellier," tom. xx. p. 109 (which I have not been able to find), the case of a man, aged forty-five, who turned gray from fright, and in two years recovered the original colour of his hair (brown).

Rostan relates the case of an old woman, aged seventy, who had always enjoyed good health. Her daughter had two children, which she left in charge of their grandmother. They were found to be syphilitic. Their mother accused the grandmother of being the cause of this, and jumped out of the window with both her children. The next day the old woman found herself completely black, darkest on the face, palms of the hands, soles of the feet, folds of the groins and breasts. The anterior part of the legs was dotted with white patches. She eventually died of pneumonia. It is mentioned that she was covered with lice, but not when this commenced.

Lecat mentions (p. 173) a case of pigmentation of the eyelids caused by fright, which extended to the face and arms, and eventually cured itself by desquamation. Desquamation of pigmented skin in a case of Dr. Dyce Duckworth's is related in Sir J. R. Cormack's chemical studies.

Emotion falling short of grief or terror may produce pigmentation. Alibert (p. 415) says, "Une jeune dame, très belle, d'une peau très blanche, voyait se développer à la surface de ses deux seins, ainsi qu'à la région abdominale, des petites taches, circonscrites, isolées, du diamètre d'une monnaie de dix sous, toutes les fois qu'elle éprouvoit la plus légère contrariété. Mais ces tâches ne duroient que cinq ou six heures." In this case the face escaped, which is unusual. The small amount of annoyance required to produce the effect is remarkable.

If pregnancy, menstruation, and emotion are each alone capable of producing pigmentary changes, it is not surprising that these changes should follow combinations of more than one of these causes.

Rostan (p. 22) mentions a woman of feeble health, who was imprisoned in Paris during the first revolution for having spoken well of the king, and was condemned to death. The instrument of execution (la lanterne) was produced in her presence suddenly. Her catamenia, which were present, ceased; and although her execution was suspended by the influence of an exalted personage, she soon after became dark (comme des negres peu foncés) all over, except some white patches on the legs (such as are seen in some of the American negroes), till her death, at the age of seventy-five, more than thirty years after the occurrence.

Lecat (pp. 136, &c.) relates the case of Mme. la Duchesse de D., of hysterical temperament, who, being depressed by great grief during pregnancy, became pigmented all over the forehead, eyelids, and face, with hyperæsthesia of the affected surfaces. This ended in discharge of pigment by the sweat glands (stearrhœa nigra), blackening handkerchiefs and eventually removing all the pigment (together with desquamation in one pregnancy). This was repeated in successive pregnancies.

Stearrhœa Nigricans (Laycock).—A few words will suffice for this affection, to which allusion has just been made. It is principally of two colours, black (nigricans), and yellow (flavescens). As we have just seen, it may result from fright, and, indeed, from the same causes as the other forms of pigmentation. It is seen only in women, generally in young women.

Yonge mentions such a case in the Phil. Trans. A.D. 1709, in a girl aged sixteen who had never menstruated.

Dr. Dyce Duckworth informs me that a case of this sort has been under his care, in which the secretion of pigment from the free surface of the skin was undoubted.

It is necessary to remark that cases have been known in which women have imitated this condition with paint by way of enhancing their personal attractions.

Antithesis between Pigment and Fat.—Heusinger, as above stated, remarks (p. 21) on this subject, that eunuchs are generally very fair and fat, that is, their pigment is diminished and their fat increased.

This is probably a real antithesis, but the dictum must not be pressed too far; for, as we have seen, pigmentation often occurs in the course of diseases, especially of debilitating diseases, which naturally are also characterised by emaciation. Again, jaundice would obviously have to be excluded.

We have seen that pigmentation is largely under the control of the nervous system; we have just seen that there is an antithesis between pigmentation and fat; it remains to mention that there is an antithesis between emaciation and a healthy state of the nervous system, or, in other words, a direct relation between a certain proportion of fat and a healthy nervous condition. This would be *a priori* probable, inasmuch as the nervous tissue is rich in fat; it is also exemplified by the great value of such a medicine as cod-liver oil as a nervine tonic, and also by the fact —for which I have the authority of a very distinguished physician expert in nervous disorders—that nervous patients require fatty food, and that the crusade against obesity, lately inaugurated under the standard of a Banting, has had for its results the replenishing of the coffers of nervous specialists.

The Connection between the Nervous System and Pigmentation.

—I shall just refer to the presence of pigment not only in the eye but in the olfactory region of the nose, and in relation with the ultimate acoustic elements of the internal ear, together with the fact mentioned by Darwin, that white cats are deaf, as a further indication of the close connection between the nervous and the pigmentary systems.

I have thought it better to reserve the cases from my own notebook thus far, rather than to distribute them under their proper departments.

Case I.—(Dark blonde.) Scanty and irregular menstruation with headache; pigmentation of hands and face, increasing at periods; palpitation of heart.

M. A., dark blonde, with gray eyes, aged forty-two, married twenty-one years, six children, the last six years old. Catamenia always scanty, and for the last eight years very irregular, at intervals of three to ten months. When about thirty years old she noticed that the backs of the hands and the face became brown at each period, the pigmentation beginning a few days before the flow, lasting two or three days after the flow, generally darkest in the middle of the period, sometimes just at its cessation. Has always been subject to headaches, especially at the monthly period; when she has headache at this time the pigmentation is darker than usual. Never becomes pigmented except at a period which may only occur once in three to ten months. No family history of pigmentation. Subject to palpitation; heart natural. Uterine organs healthy and not tender; no cause for dysmenorrhœa discovered.

In this case we have several possible exciting causes—first, we have to deal with a nervous woman, who (secondly) is subject to headaches, and (thirdly) to irregular and scanty menstruation. That the pigmentation depended chiefly on the disorder of menstruation is shown by the fact that headaches alone did not produce pigmentation, though they increased it when they coincided with the monthly period; and this is emphasised by the fact that the pigmentation only occurred at the periods which might be three to ten months apart.

Case II.—(Dark blonde.) Irregular and scanty menstruation; sterility; pigmentation, especially of face, axillæ, flexor surfaces of elbows and knees (but all the skin dark), increasing at periods; dyspeptic symptoms.

A. P., aged thirty, dark blonde, gray eyes; married twelve years; never pregnant. Catamenia irregular, at four to eight weeks' interval; scanty; no pain. Always very nervous; subject to palpitation (heart natural); not subject to headaches.

Two years ago noticed that face and neck, hands, and arms were brown, and became browner at the monthly periods, the change beginning about a week before the flow: they were brownest during the flow, and became lighter after its cessation. Face, axillæ, flexor surfaces of elbows and knees brownest, but all the skin seems brown. The face is not uniform, but there are irregular browner patches. Sclerotics and mucous membrane of mouth natural. No family history of pigmentation. For the last six months she has complained of pain and nausea after food.

In this case we also have a multiplicity of possible causes. The patient was nervous; her pigmentation began gradually, and most probably was connected with her imperfect uterine condition, as shown by irregular and scanty menstruation with sterility, especially as the colour became more intense at the monthly periods.

Case III.—(Brunette.) Painful and irregular menstruation; sterility; nervousness; headaches with retching, and pigmentation of face and neck immediately preceding period.

E. A., aged twenty-nine, brunette, dark-brown eyes; married three years; never pregnant; catamenia very regular; intervals as long as three months, but generally six weeks; always much pain from the lower hypogastrium to the base of the sacrum, "as if the inside were falling out." Three days before the period she has "painful sitting." The pain of the period sometimes lays her up on the sofa the day before the flow and the first day of the flow. Always very nervous; subject to headaches, which begin three days before the period, and are situated in the forehead and vertex, beginning when she rises in the morning, and lasting two or three days, accompanied by nausea and retching; no excess of urine.

For the last two years her face has been getting brown as well as the backs of the hands; browner just before the headaches (that is, some three days before the period), and becomes lighter when the headache passes off (that is, as soon as the flow is established). Face and neck uniformly brown; so dark that I inquired into her descent; but she has no foreign blood. The brown colour extending up to the roots of the hair; backs of the hands brown; nothing unusual in axillæ, sclerotics, or mouth. Uterine cervix short; uterus anteflected; cavity 2½ inches long; sound causes the pain complained of at the period. No family history either of pigmentation or nervous phenomena.

This patient, thinking herself benefited by simple treatment, ceased attending before I had an opportunity of treating her

dysmenorrhœa with graduated bougies. I do not, however, think that curing the dysmenorrhœa would have cured the pigmentation, as this was associated with the headaches rather than with the dysmenorrhœa, though I have no doubt of the solidarity of the three symptoms of dysmenorrhœa, nervous symptoms, and pigmentation.

Case IV.—(Dark blonde.) Menorrhagia; pigmentation of face, neck, axillæ, and backs of hands, increasing before the periods; occasional vomiting from some sorts of food, followed by increased pigmentation. A sister almost precisely similar.

A. B., dark blonde, aged forty-seven, married twenty-five years; nine children, the last thirteen and a half years ago, since when she has never been pregnant. Had flooding before her last confinement, and has been subject to it ever since, till within three months ago. Pigmentation of the face began twelve months after the last confinement over the ramus of each lower jaw, then on the forehead, then under the eyes (people used to ask her how she had got two black eyes), then a round spot on the right upper lip and on the bridge of the nose, then on the neck a little below the clavicles, in the axillæ, and on the backs of the hands. It gets darker before and lighter after each period. For the last three years any mixture of food always produces vomiting, which is succeeded by increased pigmentation. She can eat anything alone, but mixtures make her sick. For instance, she can eat meat alone and pudding alone, but a meal of meat and pudding together causes vomiting.

When seen, the pigmentation was mottled, the colour being darker on the cheeks, on the forehead (especially at the sides), under the eyes, on the right upper lip, and on the nose, which were brown. No pigmentation of sclerotics or inside of mouth.

A sister, who is two years older, became similarly affected at the same time. She has had five children since pigmentation began. She too has floodings. She "seems to get lighter with each child." She is darker before and lighter after each period. She also is subject to vomiting, after which she becomes darker. Her face is pigmented, but not her hands; the state of axillæ, &c., unknown.

This case is remarkable, the very strong resemblance between the two sisters in all respects indicating the essential connection between all the points of coincidence, namely, menorrhagia and vomiting, with pigmentation.

Case V.—(Dark brunette.) Frequent and copious menstruation; map-like varying pigmentation of face; headache and

various nervous symptoms; nervous family history; inherited nervousness and stammering in a daughter.

M. G., an intensely dark brunette with almost black eyes, aged thirty, married fourteen years, four children, the last eleven months ago. Catamenia formerly every three weeks; for the last six months every two weeks; always copious; no pain.

Complains of feeling confused in her head since her confinement of a still-born child, which was followed by dropsy; her tongue feels all the wrong way, "as if it was not straight" (tongue objectively quite natural), knows what she wants to say but cannot say it; has restless and sleepless nights; she fidgets and feels obliged to get out of bed to ascertain perfectly unimportant things—for instance, where a thing is for which she has no necessity whatever. When a girl she had a sort of attack of aphasia which lasted about eighteen months; could not say "yes," and made faces when she tried. (Her child, aged thirteen, has had the same sort of stammering for three years, that is, at the same age as her mother had it.) For three days she dropped things out of her hands, but has been quite right in this respect both before and since then. Passes no excess of urine.

Gets brown patches of pigment on her forehead, neck, and cheeks if nervously excited; they come and go in a few days, and are worse after a bad night.

She had the same sort of attack after her third confinement.

Mother's father died insane; mother had bad headaches and eventually died of apoplexy; one of her brothers had severe chorea during which his mind was affected, but he recovered. Her daughter has inherited her mother's stammering and nervousness (see below).

When seen, she had irregular patches of brown pigment all over her face, which changed while under observation, so that they were not the same at two visits; they were map-like, and reminded me strongly of the patches I had seen at Vienna in M. Pouchet's fish, which will be hereafter described.

Treatment at one time with strychnine, at another with valerianate of zinc twice a day, and bromide of potassium at bedtime, under both of which she temporarily improved, sleeping better, feeling her tongue comfortable, and becoming lighter in colour.

Her daughter, aged thirteen, has never menstruated. She is a brunette. For the last three years she has stammered on certain words, *e.g.*, "Augusta," "giddy," "potato," "kisses;" sometimes cannot say them at all; k's always bad; has been frightened by her father and speaks worse to him; can say the words all right when singing; has been unsteady in her movements; memory good; shy, but not timid; not strong, rather overgrown.

She improved under strychnine, given with orders to her father not to frighten her.

In this most interesting case we have a history of frequent and copious menstruation, increasingly so since the last confinement, with a history of a similar attack in the last confinement but one, but also a most complete history of nervous affection, inherited and transmitted, with various manifestations, perversion of speech, perverted conscientiousness, the exacerbations plainly connected with the exacerbations of pigmentation. The inheritance by the daughter of disordered speech at the same age as that at which the mother acquired it is in accordance with the law of "inheritance at corresponding periods of life" (Darwin, No. 1, vol. i. p. 280; No. 2, vol. ii. p. 75), a law which applies with special force to nervous states, inasmuch as they are very apt to be transmitted.

Case VI.—(Brunette.) Rheumatic fever five times; formerly hæmoptysis; amenorrhœa thirteen months; pigmentation of face three months; occasional pain at apices of lungs and under heart, after which pigmentation increases.

H. C., brunette, aged thirty-four, married twelve years; three children, the last four years ago; has had rheumatic fever five times, the last attack four years ago; has also had hæmoptysis, for which she has been under treatment at Victoria Park Hospital; amenorrhœa thirteen months (is not pregnant). For the last two or three months her friends have noticed that her face is brown. She used to turn purple in her face when a girl. At times she has periods of great weakness, with pain at the apices of the lungs and under the heart, during which her face gets browner; also she has attacks of pain in the face, which produce no effect on the pigment.

When seen, the whole of the face was uniformly brown to the roots of the hair, not the hands (?), nor axillæ, nor sclerotics. Heart feeble; no murmur; depressions beneath both clavicles, with prolonged expiration at right side; no evidence of active mischief. Thorax long.

In this case we should refer the pigmentation rather to the serious disease under which the patient had suffered, than to the amenorrhœa, which was probably another consequence of the same cause; but even thus they are associated, and the pigmentation was increased during attacks of pain.

I need only now refer to the presence, in all these six cases, of uterine disorder, generally associated with nervous phenomena.

Case VII.—Dysmenorrhœa, dyspepsia, pigmentation of face, pains in head, face, and neck.

M. M., machinist, single, aged thirty. Catamenia regular, preceded by great pain in sacrum and hypogastrium. At Christmas, 1878, had "pleurisy," for which she was a patient at the London Hospital. After this her face became "suddenly" dark, and has remained so ever since; from that time she has also been subject to great pains, beginning on each cheek (at the site of a pigmented patch to be afterwards described), and extending over the frontal region to the back of the head, down the back of the neck, and down the shoulders, in the direction of the descending branches of the cervical plexus. These pains are usually worse every other day, but she has not been free from them since Christmas; they are worse at night. Pigmentation not affected by catamenia. Her food is apt to disagree with her, and then the skin turns yellow or brown at once. Is very nervous.

Face pigmented brown, especially a patch on each cheek, no pigmentation except on face. Three weeks ago she was "black," has been getting lighter since. Neck is painful to touch, a few round marks on it (ascertained not to be tinea versicolor).

A belladonna plaster on the neck seemed to relieve the pain somewhat. While under observation her legs swelled; no cause discoverable. She ceased to attend after three visits.

In this case the association between pigmentation and local pain and between pigmentation and dyspepsia were the marked phenomena. Dysmenorrhœa was present though the pigmentation seemed to be not directly connected with it. The patient was distinctly neurotic.

The associated phenomena in the case were thus nervous temperament, neuralgia, dyspepsia, dysmenorrhœa, and pigmentation.

Case VIII.—Pigmentation of face and backs of hands connected with menstruation.

J. T., aged twenty-three, married two years, one child a year old.

Catamenia regular till eleven weeks ago, since when she has been nothing; always associated with pain in the bottom of the back, not very severe.

For the last three years she has noticed yellowness of the face and backs of the hands. She begins to get yellow a week before the period begins, and gets lighter a week after it ceases. Has always been very nervous. Hardly ever free from headaches; worse since confinement; situated in the forehead; not worse at periods.

Face brown, pigmentation darkest round the eyes and on the cheeks. None on the neck, chest, axillæ, mouth, or sclerotics. She says the lower maxillæ are darkest at times. Not at her darkest when she saw me. She only attended once.

In this case we have a nervous history, and the pigmentation was plainly associated with the menstrual period.

The question of the prepotence of the nervous or the generative system as a cause of pigmentation must be postponed till we have considered the comparative anatomy of pigment.

Pigmentation of the lower eyelid has been mentioned as a common consequence of various causes. I have seen this appear quite quickly in both sexes under depressing or annoying circumstances.

The pigmentation all round the eye, which has also been mentioned, I have seen arise suddenly in a patient of mine. After her confinement, which was short and easy, she had a perfect pair of spectacles round her eyes, up to the edge of the orbits; this gradually disappeared in a few days. The same thing developed itself suddenly during the extraction of a tooth. Here the nervous influence is plain and beyond doubt.

Comparative Anatomy.—The rapid changes of colour in some amphibia and reptiles (as the frog and the chameleon) have long been known, and even become proverbial.

Stark, in 1830, observed the changes in colour in some fresh-water fish according to the colour of the bottom. On sandy bottoms flat fish and eels are lighter than on rocky coasts. The fishermen say they take their colour from the bottom.

In 1851 Brücke established the influence of the nerves on the colour of the chameleon, and showed the change to depend on the expansion and concentration of the pigmentary cells both in the chameleon and in the frog.

In 1854 Von Wittich proved these changes to be decidedly dependent on the central nervous system, and yet to be also largely independent of it; so that after destruction of the spinal cord, after section of separate nerves, even after isolation of entire tracts of the skin, these show almost the same sensibility to mechanical, electrical, or luminous irritation as before. He concluded that the skin, like the heart, intestines, and other viscera, possesses intrinsic ganglia.

In 1858 Lister concluded, from his researches on frogs, that the cerebro-spinal axis is chiefly, if not exclusively, concerned in regulating the functions of the pigment cells though the circulation through the part also affects it. Excitement of the frog, or a violent struggle, or the access of light, all make it light in colour, the pigment molecules being seen to roll along the off-shoots of the branched cells towards the centre. When the skin is pale the pigment is concentrated. Death causes concentration of the pigment, that is, the frog is light. The concentration

takes place, not to the nucleus, but to the centre of the mass of granules. If the cells are paralysed by a galvanic shock, neither diffusion nor concentration can take place. The granules do not always move all the same way; while some roll towards the centre, others roll away from it. After section of the sciatic nerve the pigment becomes diffused, and the leg and foot turn very dark. A blind frog underwent no changes in response to light. Changes occur in an amputated limb for ten days, and even in pieces of it, not all simultaneous or alike.

Lister concludes, like Von Wittich, that there are probably intrinsic ganglia in the leg.

In 1869 Hering stated his belief that the pigment cells are affected through the blood-vessels, that is, through the vasomotor nerves.

In 1876 Pouchet, who had for some years been at work on the subject of pigment, again reviewed the matter, and gave the results of all his preceding investigations in a most valuable paper in the "Journal de l'Anatomie et de Physiologie." Experimenting principally on fishes, he proved the influence of electricity and the approach of death on pigment. He proved (p. 73) that fish gain the power of changing colour quickly by practice and lose it by disuse. This is in accordance with the known law that nervous changes travel more and more easily along more and more frequently traversed routes. (See also Spencer, *loc. cit.*, vol. ii. p. 350.) A turbot (p. 76) became at once spotted brown and then black when disturbed, when a dark object or the hand was held above it, or when the vessel was struck; but throwing light into its eyes, or bringing a white disc before them, produced no change.

The rapidity of effect varies in different individuals.

The cerebral influence is considerable. Fish of the same species, taken from separate sources and placed under common circumstances, are not of the same colour, because they probably feel uncomfortable in each other's presence.

Two chameleons, which were unlike in colour when awake, became of the same colour when asleep, the cerebral influence being in abeyance.

Extirpation of the eye (which would not abolish cerebral influence but would abolish that of vision) produces in fishes a nearly fixed colour. Extirpation of one eye does not produce any effect, either one-sided or two-sided. The chromatic function and the structure of the chromoblasts (pigment cells) are most complicated in the cephalopoda.

His principal conclusions are the following (p. 160):—

The pigmentary elements are more or less endowed with

sarcodic movements. Electricity, the nervous system, malaise, the approach of death, &c., influence these movements.

The change of colour according to the bottom of the sea, known vaguely to fishermen in fish and crustacea, is widely distributed in the animal kingdom.

Some creatures have the power of simultaneously becoming lighter in one part and darker in another.

In all cases the change depends on expansion or concentration of the chromoblasts.

The chromatic function, like all others, is affected by habit.

The chromatic function in species where it is easily affected (où elle se gouverne facilement) is immediately abolished by extirpation of the eyes or section of the optic nerves.

The chromoblasts then generally remain in a medium state of expansion.

Pathological cases of lesions in fishes from disease, &c., confirm these experiments.

The chromatic function should be defined as "un ensemble d'actions réflexes sur les chromoblastes, dont le point de départ peut être l'impression visuelle résultant des propriétés actiniques du milieu ambiant."

The nerves are the conductors of this reflex action, they can produce expansion or concentration of the chromoblasts.

Section of the spinal cord does not suspend the chromatic function posterior to the section (Turbot).

Section of the intercostal nerves suspends the function in the region supplied by the nerve if made below the point of entrance of the sympathetic filament.

The destruction of the sympathetic in the lower part of the spinal canal posterior to the abdominal cavity suspends the chromatic function, but the aorta and vena cava are necessarily obliterated by the operation. This is confirmed by pathological observations.

Section of the sympathetic by the head in the turbot does not abolish the chromatic function beyond the point of section.

Section of the fifth nerve suspends the chromatic function over its distribution. This was first indicated by a pathological instance.

Section and obliteration of the submaxillary artery produces no effect on pigment.

Section of the lateral nerve does not affect the chromoblasts.

Paralysis of the chromoblasts, after section of the nerves, does not produce degeneration of the chromoblasts, which can be affected by other influences, *e.g.*, electricity.

In prawns (Palæmon) the effects are complicated by pigment of various colours, but, as in fish, the colour varies with the bottom.

The chromatic function in crustacea is suspended by extirpation of the eyes.

As in fish, the extirpation of one eye does not affect the chromatic function.

Section of the ventral cord or of the connecting bands in crustacea does not, any more than section of spinal cord in fish, abolish the chromatic function beyond the point of section.

The darkness of the night does not, but artificial darkness does affect the colour, that is, the fish is not affected by the natural alterations of light. The same in crustacea.

The eyeless lower crustacea have no chromoblasts, but not all crustacea with eyes have chromoblasts.

Curare and morphia have no action on the chromoblasts.

In some crustacea santonin produces incessant agitation of the limbs with dilatation of the chromoblasts.

Conclusions.—Thus, as far as these animals are concerned, the influence of the vascular system on pigment is eliminated.

As far as human beings are concerned we have proofs that various causes affect the pigmentary condition—age, sexual influences (especially menstruation and pregnancy), emotions (especially that of fright), diseases of various kinds, including many in which the nervous system is involved, fatiguing and debilitating influences of various kinds.

Whether the nervous system is or is not the first offender, the pigmentary changes are most probably produced through the nerves distributed to the part affected.

The suddenness with which violent emotions may produce their effect can hardly be explained by any other supposition than by the direct action of the nervous symptom.

Many of the other causes, such as various diseases, and especially changes in the sexual organs, which may at first seem to be separated from the purely nervous causes of pigmentation, are not really so, for their intimate association with the nervous system confirms the view of the essential presidence of the nervous system over pigmentation.

This is confirmed by the antithesis between fat and pigment, and the association between "nervousness" and emaciation.

The face, being as it is the dial on which the inward nervous (and especially the emotional) changes are outwardly registered, is not only the place of predilection for muscular expression, but also for vaso-motor phenomena (blushing and pallor) and for

pigmentary changes, all three being probably conducted along separate efferent routes. This is true, in a secondary sense, of the other exposed parts of the body, the hands and neck.

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