Flushing and morbid blushing : their pathology and treatment / by Harry Campbell.

FLUSHING

AND

MORBID BLUSHING

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THEIR PATHOLOGY AND TREATMENT

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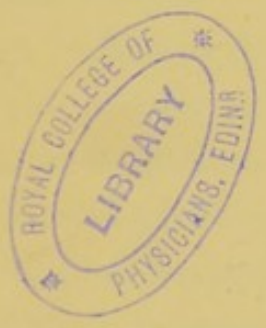

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PREFACE.

The so-called "Flush of Heat" is not an independent disease: it is one among many manifestations of a wide-spread nervous disturbance. It is, in fact, a symptom; and as such it is usually treated in medical writings, receiving little more than casual mention. On careful analysis, however, it will be found to be in itself a complex nerve-storm, presenting many points of interest to the physiologist and pathologist; and, inasmuch as the affection is very common and highly distressing to the sufferer, it has seemed to me worthy of more careful study than it has hitherto received. The chief portion of this monograph is occupied with the results of my investigation.

Morbid blushing—a term which I hope to justify—is, like flushing, a symptom. It is, however, of sufficient practical importance to the physician to merit independent study. So far as I know, only one writer—Burgess, who wrote in 1824—has dealt with this subject, and even his monograph is almost

entirely devoted to the physiological aspect of the question.

The treatment of flushing and morbid blushing resolves itself into the treatment of the nervous conditions underlying them. I have therefore embraced this opportunity of setting forth what I conceive to be the general principles which should guide us in the treatment of functional nervous diseases in general.

H. C.

London, *May* 1, 1890.

CONTENTS.

PART I.

PHYSIOLOGICAL.

PART II.

FLUSHING.

PART III.

BLUSHING.

PART IV.

TREATMENT.

LIST OF ILLUSTRATIONS.

PART I.

PHYSIOLOGICAL.

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PHYSIOLOGICAL.

The Skin.—The skin consists of two main layers: the epidermis and the dermis, the upper surface of the dermis being heaped up into papillæ. The epidermis is made up of epithelial cells; it contains no blood-vessels, but is provided in its under part with nerves. From this layer, by a down growth of the epithelium into the dermic and subdermic tissues, the hairs, sebaceous glands, and sweat glands are developed. The sebaceous glands are situated in the dermis, and they almost always open into the hair follicles or tubes containing the hairs. These tubes with their contained hairs extend deep into the dermic or even into the sub-dermic tissue. The sweat glands, on the other hand, are wholly situated in the latter, their ducts alone being contained in the skin proper, namely, in the dermis and epidermis. (See Fig. I.)

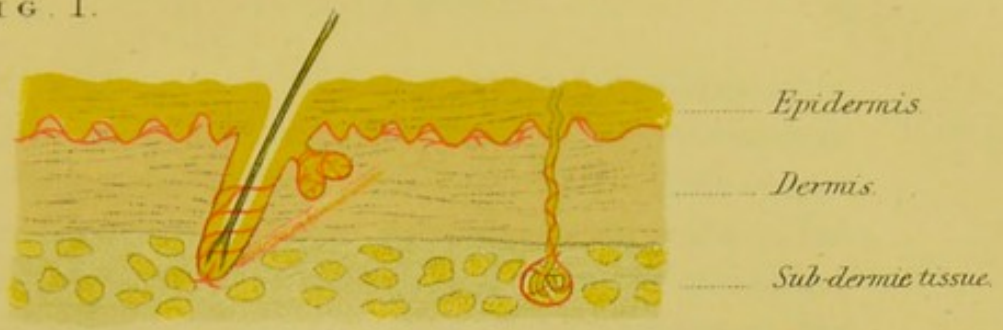
The skin contains three separate systems of unstriped muscles, independently of those supplying the vessels—arteries, veins and lymphatics: *a*, a muscular layer surrounds the sebaceous ducts; this by its contraction presses the oil of the gland into the hair

follicle, thus lubricating the hair and the surface of the skin; *b*, a similar layer surrounds the ducts of the sweat glands, and acts in a similar way; *c*, finally, each hair is furnished with an erecting muscle. Connected with each individual fibre of these several muscular systems is a nerve twig terminating in its nucleus, and these nerve twigs are all represented in the central nervous system. As they are numbered by the million, it follows that the three cutaneous muscular systems have a highly complex nervous apparatus.

The blood-vessels of the skin are arranged in a superficial and a deep-seated system. From the former the dermic papillæ are supplied. The latter breaks up into three separate systems:—*a*, one for the hair follicles, *b*, one for the sebaceous glands in connection with them, *c*, one for the sweat glands. Each individual vascular plexus is under the control of the vaso-motor system. Whether the vaso-motor filaments supplying the vascular systems of the cutaneous glands are vaso-constrictor or vaso-dilator has not yet been determined; but it has been thought that in common with those going to other glandular arteries they are chiefly, if not entirely, vaso-dilator. However this may be, we may safely affirm that each of the several cutaneous vascular systems (of dermic papillæ, sebaceous glands, hair follicles, sweat glands) is supplied with a distinct vaso-motor system of its own, and that *any one of them may be affected independently of the others.* Upon this point I desire to lay particular stress.

As with the muscular fibres so with the epithelial cells of every gland in the body,—each is supplied

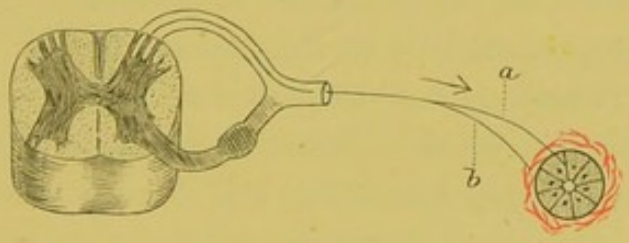
FIG. 1.



In this diagram, kindly drawn for me by Dr. W. W. O. Beveridge, the epidermis is coloured yellow, the dermis pale rose, and the subdermic tissue blue. The hair follicle, sebaceous gland, and sweat gland are, like the epidermis from which they are developed, coloured yellow; the hair itself, for the sake of contrast, being green. The hair follicle in this instance is made to dip down into the subdermic tissue; sometimes, however, it ends in the dermis. The sebaceous follicle is always embedded in this latter, while the coils of the sweat gland are always contained in the subdermic tissue, as indicated. The band extending from the base of the hair follicle to the right represents an arrector pili, which is generally on the same side of the follicle as the sebaceous gland opening into it.

The diagram is chiefly intended to show the arrangement of the blood-vessels in the skin. These are coloured red, and arranged as follows:—(1) A superficial system supplying the dermic papillæ—dilatation of this system causes redness of the skin; contraction, a blanching of it. (2) A deeper system supplying *a*, the sebaceous glands; *b*, the hair follicles; *c*, the sweat glands. A glance will make it manifest that the vaso-motor condition of the superficial vessels, as shown by the colour of the skin, is no necessary index of that of the lower system.

FIG. 2.



This diagram, also drawn by Dr. Beveridge, illustrates the course of the trophic (*a*) and the vaso-motor (*b*) nerve-fibres going to the sweat glands. They pass together through the anterior nerve-roots, and are distributed with the ordinary mixed nerves, only parting when they pass to their respective destinations. When the gland is made to secrete by nervous influences an impulse passes along *b*, causing dilatation of the vessels surrounding the gland, and along *a*, causing an increase in the activities of the epithelial cells.

with a nerve-twig. In the case of the cutaneous glands these trophic nerves run with the corresponding vaso-motor nerves. (See Fig. II.) Both escape from the cord by the anterior nerve roots. The subordinate sweat centres are situated in the spinal cord, and are dominated by a higher centre in the medulla, the whole probably being under the control of supreme cortical centres.

Whenever a gland secretes, two things happen—*a*, the arteries supplying it are made to dilate by the action of vaso-motor (dilator ?) nerves, so that the epithelial cells are flushed with an abundance of plasma; *b*, impulses strike upon the cells through their trophic nerves. Mere arterial dilatation will not of itself cause increased secretion: the gland-cell must be struck from without through the nervous system, and such direct nervous influence appears to be capable of causing increased secretion independently of any arterial dilatation. Thus, in an amputated limb destitute of blood, sweat may be made to pour out by irritating the sciatic nerve; moreover, after death, when all the blood has passed into the veins, sweat may be secreted in large quantities.

The behaviour of the cutaneous glands during life appears to bear out the above proposition. It often happens that the skin is flushed with blood when there is no increased secretion whatever, and on the other hand, there is often increased cutaneous secretion while the skin is apparently bloodless. For instance, during blushing, ordinary dry flushing, and the hot flush of fever, there is no increased secretion in spite of the excessive injection of the skin. On the other hand, in the cold sweats that accompany

collapse, excessive fear, and the death agony,—and during the cold sweating which so frequently occurs in debilitated states of the nervous system, there is apparent bloodlessness of the skin. When we reflect, however, upon the arrangement of the cutaneous blood-vessels in independent systems, each responding to independent vaso-motor influences, it becomes manifest that the paleness or redness of the skin is no necessary index of the calibre of the vessels supplying the cutaneous glands. For the redness or paleness of the skin depends not on this but upon the fulness or emptiness of the capillaries of the *superficial* vascular system, those, namely, supplying the dermic papillæ. The sweat glands, as observed, are situated in the subdermic tissue, and a glance at Fig. I. will show how distinct is their vascular system from that supplying the dermic papillæ. Wherefore it is quite possible that during a dry flush the superficial vessels alone are dilated, those supplying the sweat glands being contracted: the vessels of the papillæ and those of the sweat glands having, almost certainly, independent vaso-motor systems, the two might at any given time work in opposite directions. On the other hand, we cannot always be certain that the vessels supplying the sweat glands are not dilated during a cold sweat. There can, however, be little doubt that the whole thickness of the skin and subdermic tissues are anæmic during the cold sweats of fear and of collapse.

We have seen that every epithelial cell in the glands of the skin, every muscular fibre of the three sets of cutaneous muscular systems, has its nerve-twig; that every dermic papilla, hair follicle, se-

baceous gland and sweat gland has its independent system of blood-vessels, each supplied by special vaso-motor twigs, and that the lower layers of the epidermis contain nerve fibres also. We may now add that the dermic papillæ are provided with special end-organs, and the lymphatics and veins of the skin with special vaso-motor nerves. Now, all these several nerve endings are represented in the central nervous system; it is therefore manifest that the nervous apparatus of the skin is very elaborate, and hence we are prepared to find that it may be disordered in many different ways.

Vaso-motor System.—The function of the vaso-motor system is to regulate the calibre of the arteries (chiefly the smaller ones), of the veins, and of the lymphatics. The normal mean state of the arteries is one of constriction, their mean calibre during life being smaller than after death. This constriction or "tone" is to some extent independent of outside nervous influence, since it is sometimes maintained after all the nerve fibres passing to an artery have been severed, and since, moreover, both the arteries and capillaries are capable of directly responding to certain chemical stimuli. But whatever part inherent muscular activity plays in maintaining arterial tone, it seems pretty certain that it depends chiefly upon external nervous influence. There are two kinds of vaso-motor centres and nerves, viz., vaso-constrictor and vaso-dilator. The former are always in action, helping to maintain the tone, while the latter exert their influence only when some special local arterial dilatation is required. The vaso-

constrictor centres further differ from the dilator in that they are capable of both constricting and dilating the arteries, of constricting them by exerting their influence, of dilating them by withholding it. This complicates matters considerably, for while we can be fairly certain that arterial constriction is always due to the action of the vaso-constrictor centres, we are often unable to say whether arterial dilatation is due to the action of the vaso-dilator, or to the inaction of the vaso-constrictor, centres. Landois observes that the physician must be careful to distinguish between the one and the other mode of dilatation. As a matter of fact, however, he can seldom do so.

The vaso-constrictor and dilator centres are situated in the medulla and spinal cord. The constrictor centres in the cord are subordinate to a centre in the medulla by which the general arterial tone is thought to be maintained. There appears to be no similar medullary centre controlling the action of subsidiary spinal dilator centres; they, in fact, appear to be more or less evenly distributed in medulla and cord. Thus there are centres in the medulla for the dilator fibres of the chordæ tympani; and similar centres in the lumbar region for the nervi erigentes. These several vaso-motor centres are bilaterally arranged, each half of the medulla and spinal cord containing centres for the corresponding half of the body.

All the medullary and spinal vaso-motor centres are under the influence of cortical centres situated apparently in the motor region. It has been found that in this part of the cerebrum there exist centres

capable of influencing the temperature and the diameter of the blood-vessels of the opposite side of the body, as well as the action of the heart. We know that in certain psychical states the vaso-motor condition of the skin may be profoundly modified: thus in blushing the cutaneous vessels of the face and neck dilate, and, in some cases at least, the whole of the skin may be similarly affected.

The fact that in ordinary blushing under emotion a certain limited area of the skin only is affected, shows that the subsidiary centres engaged stand in definite relation to certain parts of the brain, or more accurately, to certain "nervous arrangements" in the brain.

Just as the cutaneous vessels may dilate under certain psychical states, so also may they contract, as in the pallor of fear. Whoever has seen a marked example of such pallor will not readily forget its intensity. As in blushing, the vaso-motor change probably affects the vessels of the head and face chiefly, but it may also involve other parts of the body, as when a person shivers or shudders at a "blood-curdling" tale. In proof that definite vascular areas of the skin are individually represented in the brain, we may instance the fact that when an individual apprehends danger from behind, he experiences a sensation in the back, which, as the saying is, "opens and shuts." Now if any one will analyse his feelings at such a time he will have little doubt that vaso-motor cutaneous changes play a considerable part in this sensation. It is therefore highly probable that every part of the skin is vaso-motorially represented in the cerebral cortex. But

can we stop here? If the vaso-motor system of the skin stands in definite relation to the brain, why not that of the whole body? And if the entire vaso-motor system of the body is definitely represented in the brain, why not the entire trophic system also, that system, namely, which governs the secretion of glands, the nutrition of muscles, and so forth? Indeed, we are forced to this conclusion. The very fact, so admirably brought out by Tuke's work, that by concentrating the attention on any one part of the body we can induce definite change in the nutrition of that part, shows that the trophic and vaso-motor nerves of every part of the body are definitely represented in the cortex.

Whether we choose to regard these parts, or these "nervous arrangements" of the brain, through which the vaso-motor and trophic states of the skin and other parts of the body may be influenced as the supreme vaso-motor and trophic centres, or whether we regard the influences streaming down from them as simply reflexly influencing centres in the medulla and cord, matters little, so long as we agree that these systems are definitely represented in the brain.[1]

Now, following Hughlings Jackson's principle, that the most recently evolved centres are the most unstable, we shall be prepared to trace to a cerebral origin many of the erratic vaso-motor and trophic changes observed in nervous people.

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[1] The above was written before I had studied Hughlings Jackson's writings on the same subject. These appear to me to be so important that I shall presently refer to certain of them at some length. The convenient term "nervous arrangements" was not in my original MS. I have borrowed it from him.

The vaso-constrictor and dilator fibres take different courses. The former leave the spinal cord between the second dorsal and second lumbar vertebræ, pass through the anterior roots into the mixed trunks, and thence may be traced through the white rami communicantes into the sympathetic ganglia of the main chain. They there lose their white sheath, and are distributed either through the so-called sympathetic nerves direct from the ganglia, or, re-entering the nerve trunks through the grey rami communicantes, they are distributed along with the ordinary nerves. In this latter way the constrictor nerves pass to the skin of the trunk and to the extremities which, as we know, contain no sympathetic trunks. A large number of vaso-motor nerves contain constrictor fibres only—for instance, the cervical sympathetic, and the abdominal splanchnic (see Fig. III.). The vaso-dilator fibres, unlike the vaso-constrictor, do not pass through the ganglia of the great sympathetic chain, but reach their arteries through the anterior nerve roots and the ordinary motor nerves, retaining their medullary sheaths throughout. Some vaso-motor nerves contain vaso-dilator fibres only, *e.g.*, the chordæ tympani, the nervi erigentes, and possibly the vaso-motor nerves going to the muscles.

Blood Pressure.—It is very necessary, when speaking of blood-pressure, to discriminate clearly between arterial, capillary, and venous blood-pressure. The source of all blood-pressure is the heart. The arteries, capillaries, and veins remaining the same, any increase in the force exerted by the heart on the

blood column (whether by an increase in the number of the beats—the force of each beat remaining the same—or by a more powerful contraction of the chambers) will cause an increase of blood-pressure throughout the entire blood-vascular system. When the smaller arteries contract, the resistance to the flow of blood through them increases, the heart has to work harder to overcome it,[1] and consequently the arterial blood-pressure goes up; but, the extra force thus exerted by the heart being exhausted in overcoming this increased resistance, with extreme contraction the capillary blood-pressure falls, much less blood than usual passing into the capillaries. On the other hand, with universal arterial dilatation the resistance is diminished, the heart exerts less pressure upon the blood, and the arterial blood-pressure falls; but in this case also the capillary blood-pressure falls, the explanation being this:—The blood-vascular system is capable of holding two or three times its ordinary quantity of blood, the portal venous system alone having capacity for all the blood of the body. Under normal arterial tone the blood is only able to flow at a certain rate into the veins, but when any large arterial area is dilated, and especially when all the arteries of the body are, the blood flows into them so rapidly that the arterial system is underfilled. The heart is unable to communicate the proper pressure to the attenuated column of arterial blood, and it therefore flows under very low pressure through the capillaries. The great purpose of

[1] The usual text-books do not seem to bring out this point properly.

arterial tone is to keep the blood in the arteries so that it shall be available for the capillaries, for when it is in the veins they cannot make use of it. Hence it has been well said that an animal may "bleed into its own veins." The effect of general arterial dilatation being to cut off the supply of blood to the capillaries and therefore to the tissues, a feeling of faintness is experienced. This is what occurs after the excessive administration of nitrite of amyl, and some may be inclined to think that the faintness which almost invariably accompanies ordinary flushes of heat has a like origin.

Under ordinary circumstances the rate of the heart-beat is in inverse proportion to the degree of arterial blood-pressure. We may suppose that under arterial dilatation, which leads to a fall of arterial blood-pressure, the heart quickens its beat in order to maintain the pressure. This may explain why ordinary flushes are frequently accompanied by palpitation.

The usual mode in which the capillary blood-pressure is locally raised, is by a local arterial dilatation. The diminished resistance thus resulting necessarily heightens the capillary pressure. The increase of capillary pressure may be sufficient to lead to œdema. I have seen a case of œdema of the forearm and hand lasting over two or three years and temporarily increasing at every menstruation, the arm being all the while red and hot. I am inclined to attribute the condition to a permanent vaso-motor dilatation of the arteries supplying the affected region.

The capillary blood-pressure may be also raised by a contraction of the small veins, a point that has,

so far as I know, been overlooked. I have been in the habit of attributing certain localized nervous œdemas to such localized venous contraction. Nor must we neglect the possible part that contraction of the lymphatic vessels may play in this condition, for anything which impedes the flow of the lymph through the lymphatics tends to cause œdema, and the lymphatic trunks are known to be furnished with vaso-motor nerves.

Some General Considerations regarding the Nervous System.—In making the following remarks I shall closely follow Hughlings Jackson.[1] This physician considers the nervous system from the standpoint of the evolutionist.[2] He makes three main levels of evolution:—*a*, The lowest centres, situated in the pons, medulla and cord, and which may be said to "represent" indirectly (though most nearly directly) the non-nervous tissues or "parts of the body"; *b*, the middle centres, corresponding to Ferrier's sensory[3] and motor cortical centres, and representing the same parts with double indirectness, *i.e.*, through the lowest, (="re-represent";) *c*, the highest centres, situated in the occipital (=sensory) and prefrontal (=motor) lobes, and representing them with triple indirectness, *i.e.*, through the middle and the lowest (="re-re-represent.")

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[1] Vide the Croonian Lectures, "Brit. Med. Journ." March 29, April 5 and 12, 1884; Remarks on the Evolution and Dissolution of the Nervous System, "Journal of Mental Science," April 1887; On Post-epileptic States, *Ibid.* Oct. 1888 and June 1889; "Remarks on Evolution and Dissolution of the Nervous System," No. 1, John Bale & Sons, London, 1888.

[2] For scientific purposes, not for clinical.

[3] Recently he has not spoken confidently as to the position of the sensory portions of the middle and highest levels.

FIG. 3.

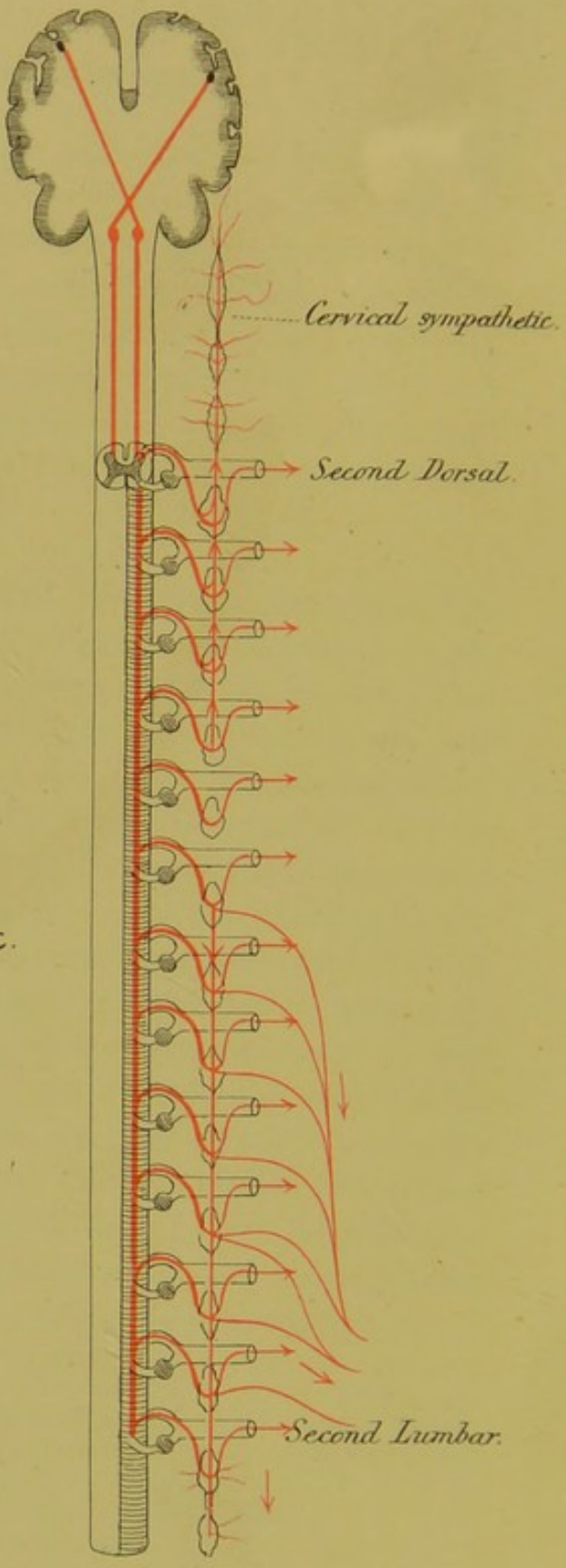
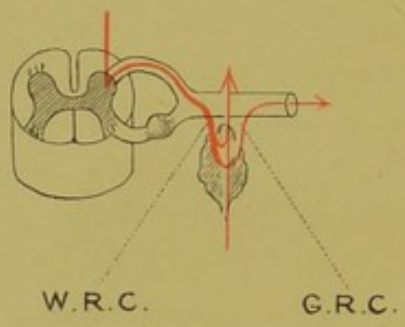


FIG. 4.



Diagrams, drawn by W. W. O. Beveridge, showing the course of the vaso-constrictor fibres. W.R.C. = white ramus communicans; G.R.C. = grey ramus communicans.

Each level consists of sensory and motor centres, —of centres which receive impulses from below, and centres which send impulses down towards the periphery. Thus the nervous system consists of a number of sensori-motor arcs. The lowest arcs consist of the lowest centres and of the ordinary afferent and efferent nerves; the middle arcs, of the middle centres and of fibres passing up to them from the lowest centres, and down again to the same; the highest arcs, of the highest centres and of fibres passing up from the middle centres and down again to these.

Each of the higher series of arcs is evolved out of, or is an outgrowth from, that next below it; thus the middle arcs are evolved out of the lowest, and the highest out of the middle. Hence it follows that each higher centre *is* the centre (or many centres) next below it, "raised to a higher power"; that is to say, each higher centre is not only potentially the centre below it, but it is this and something more, for it can produce results which the lower centre cannot. Therefore, the highest centres "re-re-represent all (literally all) parts of the body in the most complex sensori-motor combination."

The highest level of centres *both sensory and motor* constitutes the physical basis of consciousness. The nervous system being built up on the reflex type, it would be strange indeed, as Hughlings Jackson points out, if this type were departed from in that part of it which subserves consciousness. Now, seeing that these highest centres represent in the most complex ways all parts of the body, we can understand how every part may be affected by those

nervous changes which underlie the phenomena of consciousness, or, in popular language, how mind operates upon the body. "There can be little doubt," writes Jackson, "that in a severe epileptic paroxysm ('genuine epilepsy') there are effects, although very crude ones, produced in or referred to all parts of the body, animal and organic." In genuine epilepsy the attack begins, as this author long since taught, in some part of the "organ of mind," *i.e.*, in some part of the highest cerebral centres; and if this is so, we have distinct proof that the whole body is represented in those centres. The like conclusion is forced upon us by the fact I have already alluded to, that local effects may be produced in any part of the body by concentrating the attention upon that part. When the attention is so concentrated it would seem as though the sensory and motor centres representing this part in the highest level were agitated, that, in fact, the agitation of these centres constituted the physical correlative of the act of attention. And again, we are driven to the same conclusion by a study of the physical expression of the emotions. It is scarcely too much to say that every tissue of the body is involved in any violent outburst of emotion. "In strong emotional manifestations nearly all parts of the body are involved—not only the limbs, the facial, vocal and respiratory muscles, but also many internal organs. The emotional centre (the author for convenience arbitrarily assumes one) will then represent an exceedingly wide range of movements. During fright there are pallor, palpitation, and hurried respiration; occasionally there is a passage of fæces;

there is dry mouth; there is increased sweat, with coldness of skin. The popular explanation would be that there is an emotional centre which is not representative of the parts concerned in the manifestations; but that its activity produces the manifestations by acting on lower centres, which alone represent those parts. The more realistic view, I submit, is that the emotional centre itself represents, although very indirectly, the parts of the body concerned in different emotional manifestations, and that the emotion arises during the central activities which through subagency of the middle and lowest centres produce the manifestations." When the emotion is very slight the nervous changes underlying it are confined to the highest centres; it is only during intenser emotion that the "nervous force" overflows into the lower centres and thus leads to direct bodily changes.[1]

My present purpose is to lay emphasis on the dictum that *all parts of the body are represented in the highest cerebral centres.* It matters little whether these highest centres are situated in the occipital and prefrontal lobes, as Hughlings Jackson is inclined to think, so long as we agree that the entire body is represented in them wherever they are. That the cardiac and vaso-motor systems are represented in the cortex has, as we have already seen, been recently shown, and, arguing by analogy, one can scarcely doubt that similar secretory and other centres will be in due course discovered, when the important

[1] The author applies the same line of argument to the physical basis of volition, ideation, and, indeed, of all forms of mentation. See writings already referred to.

generalisation of this physician, made many years before the era of experimental cerebral physiology, will rest upon a lasting basis.

There is no occasion in this place to follow the writer in his interesting speculations further than to add that, according to him, the centres in each lower level are more "organised" and more stereotyped than those in each higher level, so that in the various diseases of the nervous system, dissolution (all disease is a species of dissolution) is apt to begin in the highest, least "organised," most unstable centres. This is another way of expressing the well-known fact that "what is last acquired is generally the first to go."

Regarding the Sensations of Heat and Cold.—Recent researches tend to show that the skin is provided with separate nervous mechanisms for touch sensations and for the sensations of heat and of cold. By carefully testing the sensibility of the skin with a delicate instrument it is possible to detect minute spots sensitive to touch sensations, others to sensations of heat (="heat spots"), and others again to sensations of cold (="cold spots"). Each series of spots is apparently sensitive to the one kind of sensation only: it has even been shown that the temperature spots are insensitive to pain, not excepting pain resulting from excessively high or low temperatures.

It must be borne in mind that the sensations of heat and of cold are not dependent upon absolutely distinct external causes,—the one on a necessarily high, and the other on a necessarily low temperature. A given temperature may at one time give rise to the

sensation of heat, and at another time to the sensation of cold. For the physicist there is no such thing as heat as distinguished from cold: he simply deals with temperature. For the psychologist, however, heat and cold are absolutely distinct; they represent distinct sensations, as distinct from one another indeed, as either is from an ordinary touch sensation. These *a priori* conclusions are now confirmed by the discovery of the "heat" and "cold" spots.

According to E. H. Weber heat is felt when the temperature of the skin rises, cold when it falls; and if this is so we must assume that the heat spots are specifically stimulated by a rise of temperature but not by a fall of it, the cold spots by a fall of temperature but not by a rise of it. According to Hering, on the other hand, heat is not felt unless the temperature of the skin rises above its "zero point"; cold, unless it sinks below this point—the zero point being that temperature at which the skin feels neither hot nor cold.

All parts of the skin are not equally sensitive to the sensations of heat and cold, and this is probably because the heat and cold spots are not equally distributed. Goldscheider, to whom we are largely indebted for our knowledge on this subject, finds that the whole of the back is very sensitive to cold, and only moderately sensitive to heat, and that the forehead and a large portion of the chest display a like peculiarity.[1]

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[1] I am indebted for most of the above facts to G. T. Ladd's work on the "Elements of Physiological Psychology," London, 1887; see p. 346 *et seq.* Blix, Goldscheider and Donaldson have made the most important investigations in this direction. Ladd's work contains all the needful references.

PART II.

FLUSHING.

PART II.

FLUSHING.

CHAPTER I.

I SHALL not attempt an accurate definition of a flush. It is sufficient for my purpose to describe it as a nerve-storm in which a rush of blood to the skin and a sense of heat are generally the most obtrusive manifestations.[1] There is no sharp dividing line between flushing and blushing. A blush has, however, this characteristic—it is always excited by some emotion, —by shyness, by shame, or by modesty ; whereas a flush may occur independently of any emotional state, and indeed, not infrequently without obvious exciting cause.

So far as the skin is concerned a flush may manifest itself in three distinct ways :—

(1) By dilatation of the cutaneous blood-vessels.

(2) By contraction of the cutaneous blood-vessels.

(3) By excitation of the sweat-glands.

In a fully developed flush all these three manifesta-

[1] Flushes of heat are known by such names as ardor volaticus, ardor fugax, bouffée de chaleur, Wallung, fliegende Hitze.

tions occur. The patient at first feels hot, some portion of the skin being flushed with blood; immediately after, or in a very short time, sweating occurs; finally, while the sweat is still on, or while it is diminishing, or after it has actually disappeared, the patient feels cold, and may shiver.

These three phases characterize what we may regard as the typical flush, but there are several modifications. (1) The order of the phenomena varies: sometimes, though rarely, the cold stage appears first; sometimes, and still more rarely, the sweating may be the preliminary cutaneous phenomenon. (2) Any one or two of the phases may be absent. Hence we get the following varieties of flush :—

A. All three phases present.	Flush, sweat, cold.	The order of the phases may differ.
B. Two phases present.	Flush, sweat, ——. Flush, ——, cold. ——, sweat, cold = "cold-sweat."	
C. One phase only present.	Dry Flush. Coldness or Shiver. Perspiration.	

It may at the first glance seem unjustifiable to consider all these different varieties under the one head, as constituting, namely, one and the same nerve-storm. It might well be argued: "Shivers, dry or moist, and simple sweats attend many and widely different conditions: a simple shiver may occur with micturition, cold sweating generally accompanies the paroxysms of angina pectoris, and so on. How, then, can we group simple shivers and sweats under the same head with flushes, regarding each and all

as essentially the same disorder?" The answer is this: A flush of heat does not consist of symptoms referable to the skin merely, (viz., redness, sweating, and shivers;) these form only part of what is really a highly complex definite nerve-storm; nor do they even constitute the criteria of the storm, any more than of other nerve-storms, such as epilepsy and megrim. During an epileptic fit the vessels of the skin may be dilated or contracted, or they may remain unaltered, and the like inconstancy is observed in megrim. No one would for a moment, in either of these cases, regard the cutaneous phenomena as the criteria of the storm; these are sought for rather in the peculiar grouping of symptoms having no reference to the skin. And just as the cutaneous phenomena are secondary and of minor importance in the paroxysm of epilepsy and in megrim, so likewise are they in that nerve-storm which is commonly called a flush, the fundamental and essential part of which is more or less independent of cutaneous changes. This is proved by the inconstancy of these latter. Thus the nerve-storm (as has been already noticed) may be attended by flushing, sweating, and shivering; by any two of these; by any one; or finally, by no cutaneous phenomena whatever. These conclusions will be brought home to the reader by a consideration of the phenomena of an ordinary blush. It will be allowed that in this case the dilatation of cutaneous vessels constitutes a part only, and by no means the essential part, of the nerve-storm which it reveals; for some people, while experiencing all the "internal phenomena" (if I may so put it) of a blush, such as mental confusion, palpitation, and general

nervous commotion, actually become white, or do not change colour at all. Yet no one will deny that the nerve-storm is one and the same in each case. Similarly, a careful study of the phenomena of a so-called flush shows that its essential symptoms may be accompanied by widely different cutaneous manifestations, and my point is actually proved by the fact that the shivering stage of a flush may detach itself, and occur as the isolated cutaneous manifestation of the storm, the internal phenomena remaining the same. Inasmuch as it would be paradoxical to speak of a simple shiver or sweat as a "flush," I shall often use the term "nerve-storm."

There is obviously some danger of describing several different varieties of nerve-storm under the one head, for almost all nerve-storms are wont to express themselves by some cutaneous change, but I believe that all the cases on which the following conclusions are based—550 in all—essentially belong to one class. It should be remembered, however, that no one class of disorders is sharply separated from all others; diseases run into one another, and their classification can only be approximate. I shall even show that it is by no means always easy to distinguish between the simple flush and *le petit mal*.

The symptoms, other than those referable to the skin, which may attend the nerve-storm we are considering are (*a*) abnormal sensations, the most common being faintness, sinking, suffocation, a craving for fresh air, a sense of impending death, giddiness, tinnitus aurium, dimness of vision, nausea; (*b*) emotional changes, *e.g.*, a feeling of melancholy, vague alarm, ill-temper; (*c*) motor phenomena, *e.g.*, muscular

weakness, tremor, palpitation, vomiting, spasm of larynx.

The Presence or Absence of the three Cutaneous Phenomena.—Of 237 cases[1] in which the presence or absence of these three cutaneous phenomena was definitely noted, there were in

110,	Heat,[2]	sweating,	cold.[3]
49,	Heat,	sweating,	——
29,	Heat,	——,	cold.
13,	Heat,	——,	——
34,	——	sweating (?),	cold.
2,	——	sweating,	——
237			

In those cases in which there was no hot stage but in which the patient felt cold, my notes do not state how frequently perspiration was present or absent.

Order of the Cutaneous Phenomena.—(*a*) Mutual relation of hot and cold stages. Of 134 cases in which the *order* of the phases was noticed, in 123 the cold stage came last; in 11 the cold stage came first. The transition from the hot to the cold stage is more or less imperceptible. The cold may indeed begin in some parts before the feeling of heat has passed away. In some cases the patient always feels cold in some part of the body during the heat, as in the following. (I should here state once for all that

[1] The patient in almost every case was a woman.

[2] I use the term "heat" instead of "flush," because it is most frequently employed by the patient to denote the stage of flushing. We shall see, however, that heat and flushing do not necessarily go hand-in-hand.

[3] The feeling of cold is in almost all cases accompanied by shivering more or less pronounced.

in quoting cases I for the most part restrict myself to those particulars alone which bear upon the special point each one is used to illustrate; but I shall often describe characteristic symptoms in order to enable the reader to form a general picture of the characteristic flush, and frequently merely to prove that the case actually *was* a flush, for many instances of flushing are disguised under other more obtrusive symptoms than the simple cutaneous manifestations.)

Æt. 39. Irreg. Suffers from dry flushes; habitually feels cold between the shoulders, and this continues even while the heats are on.

Æt. 28. Highly anæmic and amenorrhœic. Flushes; shivers sometimes during and sometimes after the flush.

Æt. 21. Menorrh. Flushes, and sweats with; she shivers while the face is flushed and sweating.

(*b*) Relation of sweating to hot and cold stages. I shall not refer to independent shivers, since the relation in time of the sweating to the shivering in these cases is not noted. I shall deal only with those cases in which there was an actual feeling of heat with, or without, the cold phase.

First, as regards the hot stage. Of 159 cases of "moist heats," as we may call them, the time at which the sweating occurred is noted in 42; of the others all that can be said is that sweating occurred during some part of the hot stage, the notes running: "Sweats with flushes." Of these 42 cases the sweating occurred—in the language of the patients—as follows :—

In 2, Before the flush.
7, Directly the flush appeared.
4, Almost immediately after the flush appeared.
1, Five minutes after the flush appeared.
1, Ten " " "
1, Fifteen " " "
3, When the flush was going off.
2, When the flush had gone off.
12, (Note runs : "Sweats after.")
9, (" "Sweats after some time.")

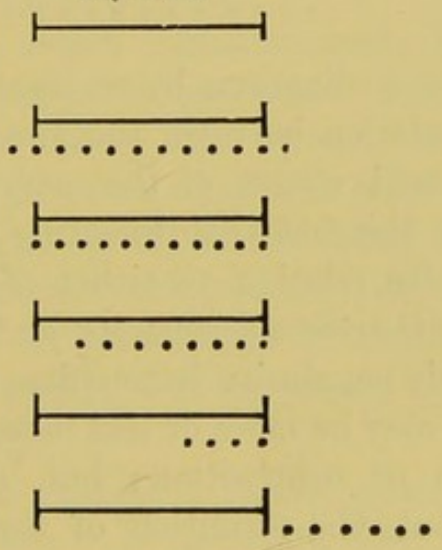
42

In the last two groups of cases the wording is obviously ambiguous ; all we can safely infer is that the sweating did not come out at the same time with the flush.

The following diagrams show the relation of the sweating to the hot stage, the black lines indicating the hot stage, the dotted lines the period of sweating.

FIG. 5.

Dry Flush.



The last line represents those cases in which the sweating does not occur until after the period of

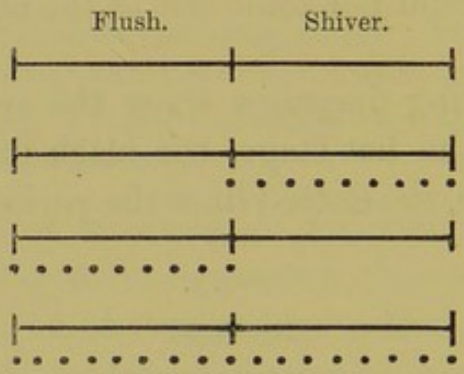
heat. In such cases there may or may not be a cold stage.

The relation of sweating to the cold stage is noticed in 45 cases. Of these, in

30, Dry flushes were followed by dry shivers.
7, " " " moist shivers (=cold sweats).
4, Moist flushes were followed by dry shivers.
4, " " " moist shivers.

These four classes may be represented by the following diagrams—

FIG. 6.



The above diagrams by no means represent every possible relation between the sweating and the hot and the cold stages of the nerve-storm, but they bring out the fact that sweating stands in no fixed and definite relation to either of these phases, and that it is therefore a separate and independent process. This conclusion harmonizes with the fact that secretion may be more or less independent of arterial dilatation or contraction; but, as I have already pointed out, the condition of the superficial blood-vessels of the skin is no index to that of the deeper ones supplying the sweat-glands.

CHAPTER II.

I SHALL now consider each of the dermic phenomena separately, beginning with the flush and sensation of heat.

Mode in which the sensation of heat and the actual flushing are distributed over the surface. —As we shall presently see, the two do not always occur together; in many cases it is uncertain if the sensation of heat in a particular area of the skin is accompanied by a corresponding dilatation of the blood-vessels. I shall, however, use the word *flush* for the present to refer to either.

The flush may begin instantaneously in all the parts affected by it, or it may start in a particular region and spread thence in a more or less definite manner. Of 143 cases in which its mode of outset was noted, in 129 it spread in the latter way, while in 14 it instantaneously affected all portions of the area implicated. Of those cases in which the flush spread in a definite direction, 91 passed upwards, 38 downwards. Thus—

129 spread in a definite direction	91	passing upwards.
	38	passing downwards.
14 affected all the parts implicated at the same time.		
143		

Sometimes the same flush passes both upwards and downwards. I have left such cases out of account in the above table, nor have I included in it those in which the flush involved only a small part of the skin, such as the face and hands, epigastrium, or a limited part of the back, since such localized flushes occur, for the most part, independently of any general nerve-storm.

The Ascending Flush.—This differs from the descending flush in one important respect; it may arise in several distinct regions below the head, and practically always ascends to the head; whereas the descending flush invariably starts in some part of the head, and may stop short of any part of the body.

Of the ascending flushes, the starting-point was noted more or less accurately in 77 cases, as under :—

a.	1,	Anterior sides of the neck.		
b.	1,	Under the left side of chin.		
c.	18,	Some part of the chest in front.		
d.	14,	,,	,,	abdomen.
e.	21,	,,	,,	back of trunk, neck, or head.
f.	5,	,,	,,	upper extremity.
g.	17,	,,	,,	lower extremity.
	77			

Each of these varieties I now proceed to consider separately.

a. Beginning in anterior sides of the neck. I have only noted down one such case, but I believe I can recall others. In this case my note runs—"The flush passed up from both sides of the neck to the face"; but what are usually called the "sides" of the neck really belong to the front, the skin thereof being continuous with that of the front of the

body. I shall therefore speak of them as the anterior sides. The cutaneous vessels of these portions of the neck are very susceptible to arterial dilatation, and they are frequently involved in ordinary blushing. When the flush rises from a part lower down, I have often noticed the anterior "sides" to redden more than the front. The central regions of the face largely escape in ordinary blushing, and the same is true of the front of the neck, so that the superficial vessels of the anterior sides of the neck and of the cheeks may be regarded as constituting a fairly definite vaso-motor area.

FIG. 7.

The redness, as indicated by shading, was confined to the left side.

b. Beginning under the left side of chin. The following case shows well the close connection between the vaso-motor centres governing the vessels of the anterior sides of the neck and cheek :—

Æt. 31. 4 ch., last 8 m. still-born. Reg. Flush starts under the left jawbone as indicated (Fig. 7), passes upwards, involving the left cheek, takes twenty minutes or more in passing up, and lasts two to three hours. Pupils equal. No other parts of the body involved in the flush. The flush comes on after meals. Patient markedly dyspeptic and debilitated.

The foregoing case scarcely constitutes what we ordinarily understand by a flush, but I cite it because it tends to throw light upon the pathology of flushing in general.

The following case may also be conveniently quoted here. In it the flush spreads forward in a remarkable way from behind the ears.

Æt. 21. Nothing 6 m. Flushes; feels two burning spots behind ears, over mastoid processes. The flush gradually passes forwards over the face, taking two or three seconds, "as if somebody were gradually passing hot hands across the face from behind"; face then reddens; "feels as if she must faint away;" slight palpitation, no cold after, and no perspiration. The flushes last five minutes, recurring in a succession of three or four in about half-an-hour.

c. Beginning in the anterior chest. The flush may begin in the upper or the lower chest. In the former case, it generally starts in the mid-sternal region. In one instance it began in the left armpit with perspiration in this region. When the flush begins in the lower chest, it is always in the left side; more accurately, in the precordial region. In these cases the heats ascend chiefly up the left side of the chest to the face, the left side of which is more involved than the right.

We shall see later that the flushes, or more accurately, the "heats," beginning in the chest and abdomen are probably not necessarily attended by dilatation of the cutaneous vessels of these parts; that they are sensory phenomena in a large degree independent of actual cutaneous changes, and that therefore they have a close connection with sensory epileptic auræ. The latter, when they commence in the chest or abdomen, are designated by Gowers pneu-

mogastric auræ, and it is interesting to note that his "epigastric" aura (a variety of pneumogastric aura) generally starts in the left side, never in the right; and that when it ascends the chest on one side, that side is always the left. Many of his cases of epigastric auræ are probably akin to those I have grouped under flushes commencing in the anterior chest, for the only chest aura of which he speaks is the "cardiac" aura—his sole test of which is apparently palpitation, a test not in my view sufficiently comprehensive for all chest auræ.[1] The following are examples of flushes beginning in the chest:—

Æt. 41. Irreg. The flush seems to begin as a fluttering in the left side of the chest; it travels up the left chest to the face, involving the left cheek chiefly. During the flush she feels startled and alarmed, and so exhausted that she is compelled to sit down. There is no sweating. After the flush she shivers, the exhaustion then somewhat abating. Can always tell by these flushes when the monthly epochs are coming.

Æt. 40. Losing little. Flushes start in heart region with palpitation, spread up the left chest to the head, then work down the arms—she says, chiefly down the left arm (?). She sweats and feels weak during the flush, and shivers after.

Æt. 31. Losing less. She flushes in anterior mid-chest, something seeming to "go off"; the flush then passes up to the head; she sweats with the flush, shivers after.

There can be no doubt that the above three cases are instances of genuine flushes, but it may happen that similar sensations rise up from the chest without cutaneous symptoms, and probably in many such cases the storm is of essentially the same nature as those in which the cutaneous symptoms are present. It is often difficult to draw the line between these

[1] See "Epilepsy, &c.," pp. 56 *et seq.* By W. R. Gowers, M.D.; Lond. 1881.

nerve-storms and attacks of *le petit mal.* The following is a case in point. I unfortunately neglected (in this instance) to enquire into the condition of the skin during the storm.

Æt. 70. Has for years suffered from curious attacks. They start in the region of the heart, pass upwards through the chest to the throat, which then feels "like a knot," and subsequently involve the head. If she does not sit down at once, she falls. There is often a momentary loss of consciousness. Sometimes the attack passes downwards to the legs.

It is noteworthy that Marshall Hall observed attacks of what he calls blushing merging into epileptiform seizures. "I have known mere blushing to become intense, constantly recurrent on every slight occasion, and attended by varied mental distress, and even to pass into an epileptiform affection."[1]

The sensori-motor nervous systems of the heart and respiratory apparatus are very susceptible. Think, for instance, how profoundly they are implicated during deep emotion; at such times curious sensations referable to the heart, with disordered action of it, and a choking sensation in the throat, are very common.[2] Seeing then how highly sensitive these systems are, no wonder that they should suffer in those minor nerve-storms so common in debilitated states of the body. In women, especially, in whom the emotional being is much more unstable than in men, we should expect to find disturbances of this portion of the nervous system. When such systems form part of an epileptic aura,

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[1] "On Paroxysmal Diseases of the Cerebro-spinal System as a Class." (Croonian Lectures, 1851, § 2, p. 49.)

[2] I would emphasize the fact that the chest sensations in emotion are chiefly referred to the left side, never so far as I know to the right.

they are due, as the most competent authorities contend, to changes originating in the cortex, and I would here observe that the same may be true of a "flush" starting in the chest. Indeed, in all those emotional states in which exactly the same symptoms may occur, it is quite certain that the nerve disturbance originates in the cortex.

d. Flushes commencing in the abdomen. The flush may begin in the epigastrium or in the lower abdomen—more frequently the former. The following are examples :—

Æt. 58. Post climac. 7 years. Has indigestion. The flushes are brought on by taking food, especially tea. They seem to work up from the pit of the stomach or chest in front. As the feeling passes over the throat, she becomes quite hoarse, as if she had a bad cold, and she experiences a choking sensation. The heat is felt in the face and hands chiefly, and is immediately accompanied by slight perspiration round the eyes and nose. As the heat subsides, she often has nausea and retching. After the heat she shivers and feels faint.

Æt. 46. Nothing 6 m. Flushes start in epigastrium, and travel up quickly to the face ; feels sick, and sweats in chest while hot. Shivers after.

Æt. 42. Reg. but less. Flushes start in abdomen, and pass up to the head. She sweats much with the flush, and feels as if she were going to die. She shivers after, and during the cold stage retches, bringing up foam.

In each of the above cases there seems little doubt that the storm started in the gastric nerve centres. In the following, the flush started in the lower abdomen:—

Æt. 35. Less. A burning sensation rises up from the bottom of the abdomen, and passes up the front of the chest, along the anterior sides of the neck, to the face and forehead. The scalp is not affected, neither are the arms. When the heat first comes on there is a "watery feeling before the eyes." She sweats, trembles, and has palpitation with the heat, feeling cold afterwards, chiefly in hands and arms.

I have already alluded to Gowers' assertion that an "epigastric" aura always, when it ascends the chest, passes up on the left and never on the right side. In the following flush the sensation passed up on the right side :—

Æt. 43. Less. Thin, anæmic woman. Hair grey. The flush spreads up the chest chiefly on the right side, and involves the right side of the face chiefly. (This latter statement confirmed by my own observation.) After a little time perspires, and more on the right than on the left side of the face. She is faint during the flush, and the heart palpitates, and she will then feel sick and burst out crying. Shivers after all is over, but is not faint. These attacks have been so bad lately that she fears to go out on their account.

The right pupil of this patient was larger than the left. This, coupled with the fact that the flushing and sweating were most marked on the right side of the face, suggests that there was some affection of the right sympathetic, and this may account for the flush ascending, contrary to the general rule, the right side chiefly.

We now come to a highly interesting group of cases :—

e. Flushes beginning in the back of the trunk, neck, or head. The epileptic auræ referred to the back of the trunk Gowers terms "spinal," and this spinal aura, he tells us, is almost the only one referable to the trunk which is not distinctly visceral.[1] Gowers further points out that these auræ not infrequently ascend to the back of the head, and that all the cases of spinal auræ which he observed were epileptic, none hysteroid.

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[1] *Ibid.* p. 54.

This class of flushes may start from the back of the head (*e.g.*, behind the ears); from the back of the neck; and from the upper or lower part of the back of the trunk. It may also be mentioned here that flushes may start in the feet and ascend the back of the trunk. In all these cases the course of the flush is highly interesting, as will be seen from the following:—

Æt. 53. Post climac. 6 yrs. Heat rushes up from behind the ears, over the scalp, where it is very distinctly felt, into the face.

Æt. 21. Reg. but less. Flushes start from the back of the neck, pass over the head to the face, which is then scarlet, but go no farther. The forehead perspires just before the flush goes off. She then goes cold and feels faint.

Æt. 44. Climac. Flushes when the menstrual periods come round. The flushes sometimes begin in the feet, and pass upwards as far as the forehead, but they more frequently commence in the back of the neck, and pass over the scalp and so down the body, sometimes as far as the feet, when she notices a peculiar fidgety feeling across the toes. She sweats very much with the flush, and feels dreadfully faint. There is no cold stage.

Æt. 46. Full-blooded woman. Never menstruated. Has suffered from flushes for four years. They start from the middle of the back, and pass over neck and scalp to forehead and face. Feels suffocated during the heats, and sweats. Shivers after.

Æt. 30. Nothing 2 m. Flushes start at the bottom of the back, passing up back over the head. Sweats with; no shiver.

Æt. ? Breaks out into a perspiration, is hot almost directly afterwards, and finally shivers. The heat starts in the toes, passes up the back of the trunk to the back of the neck, thence to the face. Feels nervous and weak during the flush, as though she would "like to go to bed and do nothing."

When the flush passes from the back of the neck to the face, it generally involves the scalp first. In the last case the scalp apparently escaped. In the following case it was distinctly noticed to pass from the back of the neck along the sides to the face:—

Æt. 27. Four children, nursing 7 weeks. Heat starts from bottom of back, passing up back, round the sides and front of the neck to the face. Sweats with, shivers after. During the flush she feels faint and trembling; the heart palpitates, and she feels inclined to cry.

The following case deserves special mention. In it the ascending sensation was not one of heat.

Æt. 40. Last child 10 m. ago; nothing since. Complains of the following attacks:—She has fluttering at the chest, "just as if somebody had startled her." The sensation darts through to the back, and a crawling sensation passes up between the shoulders, along the back of the neck to the top of the head. The throat then feels as if somebody were pressing on it, and the mouth fills with clear water, which seems to come from the sides. During the attack she feels dizzy and cannot speak, and the skin is all "goosey and cold." After it is all over she is covered with hot perspiration, and feels limp and strengthless. The heart occasionally seems to stop during the attack. She can generally tell when the attack is coming on by her low spirits. Four of her children have had fits, and there is a doubtful history of fits in others of her relations.

Here we seem to be on the borderland of epilepsy. Thus, in one of Gowers' cases of epilepsy, the aura consisted of a sensation "of something *crawling up the middle of the back*, which ascended higher and higher until it reached the back of the neck," when the true epileptic attack commenced.

The following are somewhat similar cases. In the second, however, no mention was made of any flush.

Æt. 64. A sensation, which is distinctly not one of heat, passes up the back, starting at the level of the waist. It passes over the head to the forehead. Then the face flushes, and she perspires.

Æt. 36. Nursing. The patient complains of a sensation as of a mouse running up the back, "like something alive in the chemise." Had similar sensation while carrying last child 7 m. ago.

The back of the trunk, of the neck, and of the head are frequently involved together in sensory disturbance, more especially the back of the neck and of the head; and in these cases the sensation is very apt to travel upwards. I have noticed shivers travelling up in this way, and have notes of several cases of headache in which the posterior neck was involved, and in many of these the pain seemed to strike from below upwards, sometimes passing as far as the vertex. This continuity of surface is probably represented by a like continuity of sensory centres, constituting a group which for some reason or other is peculiarly apt to be disturbed in disease. Why the heat or other sensations originating in the back of the trunk or of the neck should always pass upwards and never downwards, I cannot say, but this harmonizes with the general rule already given, that the sensation of heat when it originates below the head always passes upwards. Is it because the sensory centres belonging to the upper part of the body are more unstable than those belonging to the lower?

We have seen why abnormal sensations are apt to involve the chest and throat. Can we explain the frequent reference of them to the back, and notably to the spinal region? It is interesting to observe in this connection how frequently peculiar sensations are felt in the back under emotional disturbances. When we come to deal with shivers we shall see why they so often affect this part, but I may now again direct attention to the curious sensation of "opening and shutting of the back" experienced under certain emotional conditions. One is very apt to experience this or an allied sensation when

danger from behind is apprehended, while, in the case of danger threatening from the front, the abnormal sensations are felt chiefly there. I presume that in either case the concentration of the attention upon a certain part of the body renders the centres representing that part apt to explode.

f. Commencing in the upper extremity. The following are examples of such flushes :—

Æt. 53. Climac. Flushes after dyspeptic pains, shivers after the flush. The flushes travel up the arms to the head and face, and then pass down to legs (front or behind). Feels faint during the flush.

Æt. 49. Post climac. The flush begins in the back of the wrist and passes up the outer side of the arm to the face; she sweats with it, feels weak and languid, and experiences emotional alteration. Shivers after.

Æt. 47. Post climac. Feels flush first in the arms, which get red. It then spreads up to the face and passes down the back of the trunk. Sweats with, feels suffocated, and undergoes emotional change. No shiver.

g. Commencing in some part of the lower extremity. Of 17 such cases 11 originated in the feet, 1 at some level below the knees, 5 in the thighs. Of those originating in the feet, one started in the soles and passed (contrary, perhaps, to what one would expect) up the front of the body chiefly, while two commenced in the toes, one of them passing up the front, and the other up the back, of the body. The following are examples of flushes originating in the feet :—

Æt. 48. Post climacteric. Flushes pass up from feet to body and face, and then run down arms into hands; before they reach the end of the fingers they start again in the feet. She sweats and feels faint with, and shivers after, each flush.

Æt. 41. Climac. Flushes start in toes, and spread up the front

of the body to the face. Sweats, and has a stifled feeling during flush, the skin afterwards being "goosey."

Æt. 35. Flushes spread from the feet, up legs and front of body to face, the arms not apparently being involved. During flush the heart beats fast, she feels stifled and "as if she would fall."

Of those starting higher up, the following may be cited:—

Æt. 27. Irreg. Flush starts on the inner side of the thigh; a burning heat passes up the front of the body to the face, and then down the arms to the hands. She sweats very soon after and then feels cold; during the hot stage trembles, hears a boiling noise in the left ear, is giddy, and feels strengthless and inclined to cry. As soon as the attack is over she thinks to herself, "What a silly I am!"

Some of the cases just quoted may be conveniently grouped together as follows:—

Those passing up arms to head and face and then down to legs.
" " arms to face and then down back of trunk.
" " from feet to face and then down arms.
" " from thighs to face and then down arms.
" " from cardiac region to face and then down arms.

We may draw a parallel between these cases and certain sensory epileptic auræ. "There are two modes," writes Gowers,[1] "in which the arm is involved secondarily to the leg, just as there are two modes in which the leg is involved secondarily to the arm—one extension by continuity, passing from the one limb to the other by the trunk, and passing down the limb secondarily involved, and the other by separate commencement in the extremity of the second limb, and the passing of the aura UP both." The cases grouped above are examples of extension

[1] *Ibid.* p. 50.

by continuity. I have only seen one example (and that a very doubtful one) of a flush extending in the second way.

In all Gowers' cases the aura when it passed by continuity was sensory in its beginning; this, as the author observes, is as one would expect. The cerebral representation of the sensory nerves of the skin must be as continuous as the distribution of these nerves; but the underlying muscles cannot be thus continuously related, the grouping of their centres being dependent upon functional association rather than upon mere position.

The Descending Flush.—We have seen that a flush may pass up the back of the trunk and neck over the back of the head to the vertex, and thence travel down the front of the body. Similarly it may begin in some part of the head and travel downwards. In such cases it never starts below the head, but unlike the ascending flush, which practically always passes upwards as far as the head, the descending flush does not necessarily pass downwards as far as the feet, but may stop short at a higher level. The following cases form an interesting series:—

Æt. 31. Excessive. Her flushes, which are worse after meals, start from the back of the head, and pass down to between the shoulders. After the flush has remained here ¼-hour, the patient can feel, she declares, the heats passing down on the outer side of the arms as far as the elbows. The flush is slightly felt in the front of the body, but not so intensely as behind. Feels sinking and faint during the flush.

Æt. 58. Post climac. 3 years. Dry flushes, worse after meals. They begin in vertex, and work down posterior to the small of the back; she then notices them in the epigastrium, not generally in the chest.

Æt. 66. Flushes every month (= post climac. menstrual phenomenon). They begin in forehead and spread all over her. She sweats, is giddy and faint during flush, and shivers after. After the storm, has precordial anxiety.

Æt. 59. Post climac. 12 years. Flushes stopped then. Five years ago they began again, and have continued on and off ever since. They commence in the forehead, passing down the face and front chest (not behind). She then notices the heat at the elbows, whence it passes to the fingers; feels weak and stifled during flush, and has dimness of vision. No sweats or shivers.

Æt. 51. Post climac. 2 years. Has stabbing pain in left side, with limited patch of nervous eruption. Has suffered from dry flushes since the pain set in. They spread over her like a sheet from above downwards; feels faint during.

Æt. 21. Irreg. Flushes begin in face and spread downwards (over the front of the body chiefly) to fingers and toes. Feels faint and sweats during. No shiver.

Æt. 46. Climac. Flushes pass from face to neck, shoulders, and arms. Feels suffocated and depressed in spirits during, and has sweating and palpitation. Shivers after.

CHAPTER III.

Parts where the Heat is most felt.—Even when the flush is widespread it is generally felt in some regions more than in others. The face and neck are of all parts most involved in the feeling, and, I may also add, most liable to actual flushing. Many slight flushes indeed consist of little more than a reddening and burning of the face, and can frequently be scarcely distinguished from simple blushing. Sometimes the heat is felt more in one side of the face than the other. A large number of patients complain of feeling it most in the face and hands, *i.e.*, in the most exposed parts. Other regions of the body in which the heat is especially felt are the following—between the shoulders, the lower back, the epigastrium or lower abdomen. In an ordinary flush, the heat may be chiefly or *solely* felt in one of these situations, but such localized heats may occur independently of any general nerve-storm. Of more or less localized heats forming part of a general nerve-storm and essentially identical with an ordinary flush of heat, I append the following instances :—

Æt. 42. Climac. Complains of agonizing gastralgia, attended by heat over stomach, and weakness.

Æt. 55. Post climac. Dry flushes limited to the bottom of the back. Palpitation and feeling of languor during the flush. Shivers after.

Æt. 40. Dry flushes in face and back, but chiefly the latter; weaker during. Shivers after.

Æt. 43. Flushes in abdomen chiefly, (sometimes in arms and face). Faint with, cold after.

Æt. 31. More. Heat felt most in epigastrium. Trembles; feels faint and suffocated during. Shivers after.

Æt. 35. Reg. Dry flushes in small of back; feels faint then.

The following cases deserve special mention :—

Æt. 39. Less. Flushes begin in inside of mouth "like a burning fire," and travel down the throat, the face being secondarily involved. The heat disappears from mouth and throat before the face.

Æt. —. Climac. Suffers from heats in face and vulva. Faint then.

According to Burgess, blushing may be accompanied by injection of the corpora cavernosa, and this last case is interesting in this connection. The following are examples of localized heats occurring independently of any general nerve-storm :—

Æt. 31. More. Has pain, probably dyspeptic, in front of right chest, and burning heat between the shoulders.

Æt. 30. Less. After food has heat *in* or *over* stomach, cannot say which. The heat is accompanied by perspiration in the epigastric region.

Æt. 31. (Man.) Hypochondriacal. Has burning heat across the lower back; while this remains his urine scalds him.

Localized burnings may also occur in other parts of the body, *e.g.*, in the thighs or vertex. When in the latter, they generally indicate a highly nervous state.

These localized heats turn our attention to the sympathy existing between the nerves of the various viscera and the overlying skin, a subject ably dealt

with in Hilton's great work on "Rest and Pain." A sensation of heat in the epigastrium, with localized sweatings, not infrequently accompanies dyspepsia, and such being the case, we can well understand how it is that many of the ascending heats which are excited by dyspepsia take their origin in this region.

It should here be observed that the extent and intensity of the heat felt during a flush, stand in no necessary relation to the severity of the nerve-storm; a very slight or a very limited heat may be attended by the most alarming symptoms; on the other hand, a most intense and widespread heat may be almost devoid of disagreeable accompaniments. As a rule, however, the intensity and extent of the heat stand in more or less direct ratio to the severity of the storm, and the same remarks apply to the sweating which so frequently occurs with the heat.

Nature of the Sensation felt during the Hot Stage.—Sometimes the sensation felt during the hot stage is very pronounced. Thus patients may complain of feeling a "burning fire" in the back and face, of feeling like "burning coal," or "red hot;" a large number describe the sensation simply as "burning," and the terms "scorching" and "scalding" are often used. Frequently the patient complains of the "blood rushing to the head," and of "tingling" or "smarting." This may even involve the eyes, and sometimes a cold rag is applied to the head in order to cool it. One would expect the heat to be felt most during dry flushing, but I find that among those cases in which the most exaggerated terms are used, the flushes are about as frequently moist as dry. In the former cases the patient may complain of feeling as

though bathed in "hot" or indeed "scalding" water!

During the heat the sufferer frequently opens the windows and doors, or rushes into the open; if in bed, she throws off the clothes or even jumps out in the effort to get cool. It is in this way, I take it, that patients who flush much are apt to catch cold. I think there can be little doubt that such a tendency exists. Possibly, however, it is the feeling of suffocation which so frequently attends the sensation of heat, rather than the actual heat itself, which prompts these several actions.

Apart from the more or less temporary sensation of heat which accompanies a flush, many women at the climacteric and for years afterwards, as late as to the age of 70 or more, are, as is well known, very susceptible to heat and insensitive to cold. They clothe themselves more lightly than ordinary individuals, and are seldom seen sitting near the fire. One infirmary patient told me that even in the depth of winter she could not bear an extra blanket. Cold weather seems to suit such; during hot weather, on the other hand, they are apt to suffer great exhaustion and discomfort. This susceptibility to heat and insensitiveness to cold is attributed by Tilt to an excessive production of heat in the body. There is, however, no evidence, so far as I know, that this occurs, and since the feeling of heat and of cold may, we know, be quite independent of the actual body temperature, I attribute the great sensitiveness to heat which these patients exhibit to an unwonted development (be the cause what it may) of those nervous changes in the highest centres which underlie the *sensation of heat*

rather than to an actual increase of heat. The vaso-motor condition of the cutaneous blood-vessels may have something to do with it: when the skin is flushed with hot blood, a feeling of heat is *generally* felt in the flushed area: and conversely, when the cutaneous blood-vessels are contracted, a sensation of cold is usually experienced in the area constricted. That, however, the entire solution of the problem is not to be sought in the vaso-motor condition of the skin is clearly shown by the fact that the sensation of heat or cold referred to any particular part of the skin may be quite independent of the vaso-motor condition of that part. I shall presently cite examples in proof of this.

Vaso-motor Condition of the Skin during the Hot Stage.—Under ordinary circumstances the face, neck, and hands are the only parts of the body exposed to view, but among the poorer classes the arms are frequently bare also. These exposed parts are often noticed by the patients to be red during the hot stage, but, as we shall presently see, it is by no means certain that the skin of the unexposed parts is flushed with blood. The manner in which the redness is distributed over the face and neck will be more particularly described under the head of Blushing. Here I will but briefly touch upon the subject. It is not rare for the skin of the face to be injected on one side only during a flush, the sensation of heat being confined to the same side.

Æt. 44. Climac. Unilateral flush and sweating on the left side of the face; pupils equal; no difference in the calibre of the retinal vessels of the two sides; sensation somewhat less on affected side.

Æt. 32. Less. Descending flush, involving hands especially; sweats with, no shivers; right side of the face is, as a rule, distinctly redder during the flush than the left. Feels tired and exhausted while it lasts.

Æt. 40. Pregnant. Suffers much from palpitation, the face then flushing chiefly on the left side; she does not feel weaker then.

Æt. —. Climac. Has well-marked flushes with sweats, faintness, suffocation, and other morbid feelings. The heart palpitates after the flush. The left side of the face is much more injected than the right, and feels hotter. (See Fig. 8.) She used to suffer from neuralgia on this side, with redness.

FIG. 8.

The left side alone of the face flushes frequently. The patient has had neuralgia on this side, but frequently flushes when not suffering from it. The flush is most intense in the ear and its neighbourhood.

Æt. 18. Thin and anæmic. The blush is confined to the region indicated (Fig. 9). It appears when she is excited or tired.

As to the vaso-motor condition of the unexposed skin during the heats, I have little positive information to give: curiously enough, none of my

patients have observed its colour at such times. So far as my own actual observation goes, the redness of the face never extends beyond the upper part of

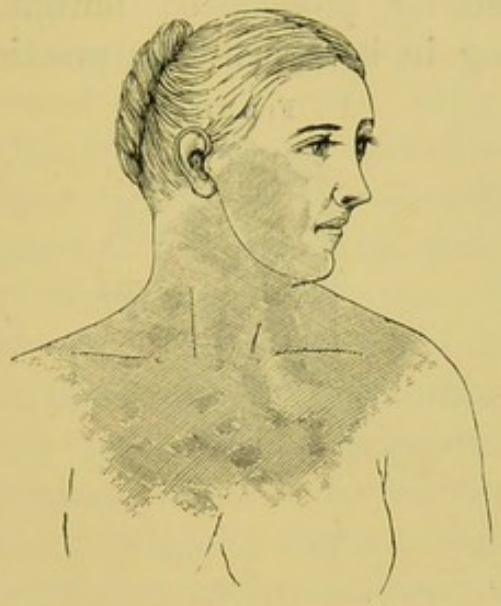
FIG. 9.

Blush confined to the region indicated. Never blushes on the opposite side of the face. This localized blush is caused by any excitement, and often appears when she is very tired.

the shoulders behind, and the middle of the chest in front (see Figs. 10, 11), and as Sir James Paget observes, its lower margin does not end abruptly, but fades away gradually by irregular blotches. This surgeon and Sir J. Crichton Browne made observations for Darwin as to the extent of the skin involved in an ordinary blush, and they both agree that usually the redness does not extend below the collar-bone. Crichton Browne, however, saw a brilliant blush rushing over the chest of a woman directly it was uncovered; Paget has heard of a little girl blushing over the abdomen and upper part of the legs at what she regarded as an act of indelicacy: and

Moreau relates the case of a girl reddening over the whole body the first time she sat as a model. (See Darwin, "The Expression of the Emotions," p. 214, *et seq.*) A somewhat similar case is related by Ogle:[1]— "A friend of mine says that in Paris he had a young man sitting to him as a model, naked or nearly so. Suddenly some political news of great importance

FIG. 10.



Showing extent of chest and shoulders involved in a case observed.

was announced, and the man became quickly excited and enraged, and my friend noticed not only that he became extremely red in the face and neck, but the entire surface of his body became bright red and lobster-like."

The cases I have just now quoted belong more properly to the subject of blushing, but I allude to them here because they prove that the vessels of

[1] Quoted by E. Long Fox ("The Influence of the Sympathetic in Disease." London, 1885).

other parts of the body than those habitually exposed may dilate under emotion; hence in a "flush" in which the nerve-storm may be widespread and intense, and in which a sensation of heat may be felt over the whole cutaneous surface, one would rather expect similar vaso-motor dilatation. It is, nevertheless, highly probable that the vaso-motor dilatation in an ordinary flush is not more widespread than in ordinary cases of pronounced blushing, the area affected being in both instances practically limited

FIG. 11.

Figure showing limit of redness behind.

to the exposed parts—to the face, neck, and sometimes arms. The cutaneous vessels of the face are more apt to dilate than any others. This is shown in blushing, and in the flush of anger and of fever. The greater tendency of the face than of other parts to crimson is well shown by the effects of nitrite of amyl, a drug which causes a dilatation of the blood-vessels throughout the body. Now, it is an interesting fact that the dilatation of cutaneous blood-vessels thus caused is most marked in the face and the neck,

though it also involves in a minor degree the skin over the chest and abdomen.[1] Tissot attributed this peculiarity to the fact that the areolar tissue of the face is more abundant and looser than that of other parts, engorgement of such tissue, according to this author, readily taking place ;[2] but this explanation is obviously fanciful. Burgess, writing in 1821, attributed the greater tendency of the face than of other parts to redden to its greater exposure, and Hagen (1847), who does not seem to have read Burgess' essay, expressed the same view. Both these authors seem to think that the mere fact of exposure alone would account for the redness in ordinary blushing being confined to the face and neck, but Darwin (1875) very sensibly remarks that, were this the whole explanation, the hands would display a similar tendency to blush. So far as blushing is concerned some further explanation was needed, and he suggested that excessive attention bestowed on the face during many generations might account for its vaso-motor susceptibility under emotional states, for it is well-known that attention directed to any part of the body is capable of affecting the vaso-motor system of that part. We shall return to this subject when we consider Blushing. Probably Darwin's and Burgess' explanations taken together account, in large measure, for the readiness with which the vaso-motor system of the face responds to emotional states. I

[1] See "The Ophthalmoscope in Mental and Cerebral Disease," by C. Aldridge: "West Riding Asylum Reports," 1871-2, p. 94.

[2] "Abhandlung über die Nerven." (Ueberset. v. Ackermann, Leipzig, 1781, Bd. ii. S. 341, as quoted by Hagen: "Psychologische Untersuch.," Braunschweig, 1847.)

would very tentatively suggest a third link in the chain of explanation. Are not the face and the head generally, more closely connected with mental processes, or rather with the nervous changes underlying them, than other parts of the body? It very frequently happens that in an epileptic fit consciousness is not lost until the aura reaches the head, and this suggests that the highest sensori-motor centres representing the head stand in very close relation to consciousness, and if such is the case, motor effects (vaso-motor amongst them) would be very apt to be produced in the region of the head secondarily to mental processes. Hughlings Jackson would of course allow that the head (including as it does the eyes, ears, articulatory muscles) is more closely connected through its representation in the highest centres with intellectual processes than other parts of the body, but he probably would not allow that it is closely associated with emotional processes.

Seeing that the dilatation of cutaneous blood-vessels during the hot stage of a flush is practically confined to the exposed parts, how, then, are we to account for the widespread sense of heat so frequently felt in flushing? In this connection I must again anticipate a future chapter by observing that in severe blushing a distinct tingling may be felt throughout the whole surface of the body, and this, in the light of the observations just quoted, would appear to be independent of local vaso-motor change. It is probably due to changes occurring in the sensorium independently of any cutaneous alteration. The question therefore arises whether the sensation of heat in an ordinary flush may not similarly be

independent of local cutaneous change. There can be no doubt that the vascular injection where it does occur (*e.g.* in face, neck, hand, and arm) takes some part in the production of the heat sensation felt in the injected area; but the question we have now to decide is whether the sensation of heat may be referred to any part independently of such vaso-dilatation.

The feeling of heat may result from two causes at least—(1) From impulses ascending to the sensorium from the skin, as when a hot object is applied to the skin, or when this tissue is flushed with an extra quantity of warm blood; (2) From a change taking place in the sensorium independently of any cutaneous change, either primarily, or secondarily to changes in other parts of the nervous system.

In an ordinary blush the local sensation of heat is chiefly, if not entirely, due to vaso-motor dilatation, *i.e.*, to impulses ascending to the sensorium from the injected cutaneous area; the tingling which is sometimes felt over a much wider area may conceivably be traceable to some unperceived cutaneous change, but, as just observed, it is probably due to a primary cortical change, and the same remarks apply to the heat felt in the unexposed portions of the skin during an ordinary flush.

Here, however, a difficulty confronts us. I have already observed that the vaso-motor condition of the superficial vessels of the skin is no safe criterion of that of the deeper ones, so that even though there be no dilatation of the superficial vessels, the deeper may be dilated; and the question therefore arises, Is dilatation of the deeper vessels of the skin alone

competent to cause a sensation of heat in the dilated area? I can only reply, in answer to this question, that the most elaborate sensory nerve-endings are situated in the papillæ of the rete Malpighii, which, as we have seen, are supplied by the superficial vascular system, and that nerve filaments, almost certainly sensory, extend into the deeper layer of the epidermis. One can scarcely doubt that the nerve-endings corresponding to the "heat spots" are very superficially placed, and that the heat produced by contact with warm objects results from the stimulation of these superficial sensory endings, for it is doubtful whether the heat would be readily conducted to the deeper parts.

But whether or not dilatation of the deeper vessels is alone competent to cause a local sensation of heat, it is certain that there is no necessary correspondence between the redness of the skin and the sensation of heat referred to it. I cite the following cases in proof of this :—

Æt. 58. Post climac. Well-marked flushes, with sweats and shivers. The flushes rise up to the face, which feels very hot, but *no matter how hot the face, it is never very red.*

Æt. 46. Climac. Flushes chiefly in the face ; sweats with, and feels faint. (The patient was flushing when note was taken, *but the face was not red.*)

Æt. 41. Climac. *Feels icy cold* in the left side of the upper part of the body, but *the skin*, she says, *is hot*, suggesting vaso-motor dilatation.

Æt. 46. Climac. Marked flushes, with suffocation, &c. ; sweats with, shivers after. The hands and face are chiefly involved in the flush ; *the hands when they feel hot go deadly pale.*

Æt. 21. Pregnant 3 m. Suffers from the following attacks :— A feeling of faintness comes over her, the head becomes dizzy ; she then feels "awfully hot all over," both in the head and body,

the heart palpitates, and she feels as if she "can't get a breath of air." *While she is hot she goes very white*, i.e., there is vaso-motor constriction. Patient retches when she begins to come to. Attributes the stifling feeling to the palpitation. This feeling compels her to undo her stays "so that she may get her breath."

These cases, taken in conjunction with the conclusions already reached, seem almost to prove that a local sensation of heat may be quite independent of vaso-motor changes in the part where the heat is felt. I am inclined to explain the sensation of heat felt during an ordinary "flush" as follows:—A flush is a nerve-storm involving certain cortical centres; whether these are involved primarily or secondarily we need not now consider in detail; suffice it to say that as regards the sensation of heat, the cortical changes which subserve it occur for the most part independently of any afferent impulses from the skin. The spread of the "heat" is probably due to the spread of the "discharge" along these centres, and as results of this discharge vaso-motor, trophic, and other efferent effects occur. The vaso-motor centres governing the vessels of the exposed portions of the skin—above all, those of the face and neck—are the most unstable, and consequently the most apt to be involved. This vaso-motor dilatation, by flushing the "heat spots" with warm blood, and thereby causing afferent impulses to pass up to the sensorium, tends to augment the sensation of heat felt in the area flushed.

CHAPTER IV.

Distribution of the Sweats. — As already observed, there is no necessary relation between the intensity and extent of the heat and the sweating. A sensation of heat which is slight in degree and limited in extent may be followed by drenching sweats over the entire body; and, on the other hand, a widely distributed and severe heat may be attended by scanty and merely local sweating, as over the forehead or the bridge of the nose. Illustrative cases :—

Æt. 43. Climac. Flushes solely on the face; during the flush she sweats all over the body, and feels sinking.

Æt. 47. Climac. Flushes spread upwards and involve the whole body; they are attended by faintness, suffocation, &c. She sweats in face only; is sometimes cold after.

The sweats are on the whole, perhaps, most marked in the face. Often the scalp is involved at the same time, the patient sometimes describing it as "sopping" or "wringing" wet. One woman declared that the hair-pins would, in a single day, rust in her hair!

The sweats may be limited to certain parts of the face, *e.g.*, to the forehead, the cheekbones, or the

boundaries of the eyes and nose. I have been more than once told that they first appeared in the neighbourhood of the nose. Often the hands are involved with the face, my note frequently running, "Hands and face perspire with the flush."

Other parts of the body especially liable to sweat with the flush are: the front of the chest, the axillæ, the epigastrium, the lower abdomen and upper part of the thighs, and the inter-scapular region. Localized sweats, like localized burnings, may occur independently of a general nerve-storm. The two not infrequently involve the same part together, *e.g.*, the epigastrium in dyspepsia. According to Long Fox, dyspepsia often leads to sweating in the hands. As other examples of reflex sweating, he mentions sweating over the parotid glands during mastication, and sweating of the feet as a result of pelvic irritation.[1]

Intensity of the Sweats.—Occasionally the sweating is very profuse. Thus, the patient may complain of being "dripping," "drenching," or "wringing" wet; of "sweating as when in a Turkish bath," of being "bathed in hot" or even "boiling water," of "lying in a pond" or "in a pool." This frequently necessitates change of clothes several times a day.

We have seen that the sweating may occur during the hot stage, during the cold stage, or during both. It is when it occurs during the hot stage that such expressions as "bathed in hot" or "boiling water" are used to describe the condition; when occurring during the cold, the sweats are called "cold sweats."

[1] Loc. cit. p. 86.

Profuse perspirations practically always occur in connection with the hot stage.

The amount of sweating occurring during the storm differs at different times. Thus a patient who complains of sweating with her flushes "just as if she were in a pond," sometimes suffers from dry flushes. The perspiration is almost always more profuse when it occurs in connection with a night than a day flush. The warmth of the bed may account for this, anything serving to excite perspiration increasing the tendency to it during a flush. Thus a patient may sweat with her flushes in summer, but not in winter.

Independent Perspirations.—Simple perspirations, without any distinct sensation of heat or cold, and occurring as part of essentially the same nerve-storm as an ordinary "flush," are, so far as I have observed, rare. I have notes of two cases only: in both the patients complained of sudden perspiration, with languor and faintness. Of course many people, especially when debilitated, are liable to drenching sweats without experiencing any sensation of heat or cold; but the sweating in such cases can scarcely be said to be a manifestation of a genuine nerve-storm. During profuse sweating of this kind, the superficial cutaneous vessels need not, I may mention, be dilated, as a very limited experience in the examination of phthisical chests teaches, and excessive dilatation of these vessels, as shown by marked redness of the skin, does not generally, so far as my experience goes, accompany excessive sweating. In such cases the excess of blood is probably attracted to the subcutaneous tissue in which the coils of the sweat glands are imbedded.

Are the Sweatings at the Climacteric Vicarious?—It has been alleged that the sweatings which occur at the climacteric are vicarious. This opinion rests upon the view, now held by few, that the menstrual flux is excretory;[1] but, even supposing this to be the case, it by no means follows that the sweatings so common at the climacteric are simply excretory also. The average quantity of blood lost at each menstrual period is 6 oz., or 48 drachms, and supposing menstruation to occur every 28 days, this would give an average quantity of less than two drachms per day. Now the average quantity of fluid excreted by the skin in the 24 hours is 32 ounces=256 drachms, and it is therefore quite evident that an increase of this amount by 2 drachms would produce no perceptible effect.

It might, however, with some plausibility, be argued that the excretory matters supposed to be circulating in the blood as the result of diminishing menstruation excite the sweat glands into increased action, much as other chemical substances may do. I have attempted, therefore, to discover whether any relation exists between the quantity of menstrual blood lost and the quantity of the perspirations occurring with the flushes. The result of such an investigation will, however, scarcely settle the question, since the patient not infrequently—I have several notes of such cases—has profuse perspirations independently of the flushes, and scarcely any, or none at all, with them. In 96 cases mention is made both as to whether the

[1] It is interesting in this connection to note that the German word *Reinigung* is often used to denote menstruation.

patient is losing more or less menstrual blood than normally, and whether the flushes are dry or moist. Of these 25 were losing more; 71 were losing less. In 9 of the patients losing more the flushes were dry, and in 16 moist; or taking the whole 25, the proportion of dry to moist was 1 : 1·7.

It is evident that in these 16 cases of moist flushes the loss of fluid by the skin could not be vicarious to the uterine flow, for on the "vicarious" hypothesis the perspiration should have been less than under ordinary circumstances. In some of them the sweating was very pronounced; one patient got "wringing" wet, another perspired "dreadfully," and a third, who had been losing blood for two months without intermission, was sweating abundantly.[1]

Of the 71 cases losing less, 18 had dry flushes, 53 moist, and taking the whole number, the proportion of dry to moist was thus about 1 : 3. If, therefore, we may depend upon these figures, dry flushes are more common when the patient is losing more than when losing less, and it would hence appear as though there were some relation between the quantity of menstrual blood lost and the amount of perspiration attending the flushes.

Are the Sweatings Beneficial?—Whether or not the independent sweatings which occur at the climacteric, or those which accompany flushes are beneficial, I am unable, from an analysis of my notes, to state. Tilt thinks that the perspirations occurring at the change of life are decidedly beneficial, and

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[1] It is well known that profuse perspirations are an expression of weakness.

that women whose skin is at this time dry are particularly apt to suffer from aggravated forms of nervousness. He also maintains that dry flushes are more distressing than those which are relieved by perspiration.[1] Some of my patients, however, have felt worse when the sweating was taking place than before it made its appearance. Thus—

Æt. 32. Reg. but less. Flush begins in the head and spreads downwards, involving the hands especially. She feels tired and exhausted. After a few minutes sweating occurs, and she then feels worse. There is no shiver.

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[1] "The Change of Life," by E. J. Tilt, M.D.; Lond., 1882, p. 102.

CHAPTER V.

The Cold Stage.—As a rule the cold stage constitutes the last phase of the storm; sometimes, however, it precedes the hot stage. Most of the non-cutaneous symptoms which attend the storm, such as faintness, suffocation, giddiness, occur, as we shall see, during the hot stage; but they sometimes continue into the cold, and may even be most developed then. Not infrequently, moreover, they attend paroxysms of cold or shivering occurring independently of any flushing of the skin or feeling of heat, and they indicate, I think, that the storm in such cases may be regarded as fundamentally the same as an ordinary flush.

I have notes of 40 such isolated paroxysms of coldness or shivers. In some the feeling of cold was limited in extent, and unaccompanied by any widespread nerve discharge, but in many cases it was part of a more or less complicated nerve-storm. I now give examples of such cases:—

Æt. 53. Has never suffered from heats or profuse sweatings; but is "perished with cold" throughout the entire body and limbs, and has cold shivers. During such shivers the whole body

shakes "inside and out," and she has a feeling as of cold water running through her veins. During the shiver she is obliged to lie down, so weak does she feel; she also has a suffocative feeling, as if she were unable to get her breath.

This case is interesting from the entire absence of heats. It is well known that these latter are very common at the climacteric. Certainly the great majority of women—according to my notes, about nine-tenths—suffer from them at this time. Now, if those cases in which heats do not occur be carefully enquired into, it will be found that independent attacks of coldness or shivers, like the above, are not uncommon. It is rare indeed for a woman to pass over the climacteric without suffering either from the one or the other.

Æt. 46. Climac. Suffers from palpitation; shivers with.

Æt. 19. Confined 2 m. ago. Ever since then has been liable to cold shivers. There is a feeling as of cold water passing down her back, and she feels "just as if she were going to faint away." The attacks come on when she is quietly sitting down.

Æt. 40. Climac. Suffers from well-marked flushes with shivers. Also from attacks of cold shivers independently of the flush, during which she feels weak.

Æt. —. Irreg. Suffers from dyspepsia. While riding in the omnibus on one occasion, she became icy cold in face and chest. There was no feeling of cold elsewhere, and no shiver. During the feeling of cold she felt faint. There was no palpitation, sickness, or sense of suffocation. Had never had such an attack before.

It may be thought that such cases as the above have nothing to do with flushes of heat. It is well known that during an ordinary faint the skin blanches and breaks out into a cold clammy sweat, and one might be inclined to class the above and similar cases under this head. In truth, it is, as I have already observed, very difficult to classify disease at all;

inasmuch, however, as a sensation of coldness or actual shivering forms part of an ordinary flush-storm, and further, since the symptoms attending these independent attacks of coldness or shivers may be practically the same as those attending such storms, we are, I think, justified in classing the two groups together. Moreover, the sensations of excessive heat and cold are probably due to closely related nervous processes.

Spread of the Sensation of Cold or Shivers.—I have only met with two cases in which the sensation of cold spread in a definite direction :—

Æt. 37. Less. Shivers in connection with flushes. The shivering starts at the occiput, and travels up to the crown of the head, but passes no farther.

Æt. —. More. Has independent sensation of cold. It begins in the face, and travels downwards to the chest.

Distribution of the Sensation of Cold or Shivers.—The sensation of cold may be felt throughout the entire body, as is shown by the following descriptions given by different patients :—

After flush feels "dreadfully cold ; seems as if something were blowing through her."

After flush shakes all over with cold.

After flush has a sensation as of cold water running through every vein.

Has independent shivers ; is then perished with cold throughout the entire body and limbs ; whole body shakes "inside and out."

After flush, shivers ; blood then seems to "run cold all over her."

As a rule, however, the cold is felt more in some places than others, and of all parts of the body the back is the most susceptible. The patients complain of being cold between the shoulders or in the

small of the back, while very frequently the sensation is compared to "cold water running down the back."

In regard to the susceptibility of the back of the trunk to the sensation of cold—and any one requiring proof of this has only to apply a cold object to his own back—the following points deserve consideration.

Under ordinary circumstances the back of the body is less protected from cold than the front; for when an individual is exposed to it he instinctively coils himself up, flexing the head and legs, and folding the arms across the front of the body so as to assume somewhat the same position as the fœtus occupies *in utero*. Any one may verify this statement for himself by watching a number of people on the top of an omnibus in very bleak weather or during a sharp shower. The advantage of this position is that the exposed cutaneous surface, and thus the area through which heat is, or can be, lost, is diminished, while at the same time the chief part of the front of the trunk is protected. The back of the trunk, however, derives no advantage from this position, and the vessels of the skin of the back being thus more frequently exposed to cold than those of the front of the trunk are more educated to contract. Hence, in the cold stage of the "flush," or in independent shivers, we should rather expect them to contract the most readily, and for the shivering (which is no doubt secondary to vaso-motor contraction) to occur most frequently in the back. It should further be remembered that the "cold spots" are relatively more abundant on the posterior than on the anterior aspect

of the trunk, and are therefore, we may assume, more abundantly represented in the highest centres.

Sometimes the flush is followed by a sensation of cold limited to a small area which differs in position in different cases, as is shown by the following list, in which the situation and nature of the sensation are described for the most part in the language of the patients :—

After flush feels " like a piece of ice below the knees."
" " has dreadful cold pressure" on the head and ears.
" notices cold chiefly in the front of the thighs.
" shivers, especially at the back of the neck.
" feels cold, chiefly in the back and chest.
" " in the hands and arms.
" " in the epigastrium.
" " in the chest and between the shoulders.
" " at the heart.

We have seen that there is no definite relation between the intensity of the heat and the extent to which perspiration takes place : similarly, the extent and intensity of the sensation of cold stand in no definite relation to either of them. A limited heat, for instance, may be followed by the most pronounced and widespread shivers.

These limited patches of cold may occur independently of any general nerve-storm, in the hands and feet, over the epigastrium, between the shoulders, on the top of the head, and other parts, just as limited patches of heat may. The hands and feet are involved with especial frequency. These are supplied by outlying portions of the vascular system, and, if we except the face, are less protected from cold than any other parts of the body—two facts which help to explain why people so frequently suffer

from cold in them. Individuals of feeble circulation —who are usually sluggish in all their vital processes, mental and bodily alike—especially suffer in this way, and must be carefully distinguished from that other class of sufferers from cold in the extremities in whom the feeling of cold is chiefly due to arterial contraction. The hands and feet being ill-protected, their cutaneous vessels are in the constant habit, like those of the back, of responding to the stimulus of cold. Since these three areas are, *par excellence*, the regions of arterial contraction, we should not marvel at the frequency with which they are involved when a tendency to pathological contraction of the cutaneous blood-vessels displays itself.

The following are a few examples of cases in which localized sensations of cold occurred in different parts of the body quite independently of a flush, the sensation itself and its position being described as usual, more or less, in the patients' own words :—

Æt. 41. Climac. Has a feeling of cold on the inner side of the left little finger, the ulnar side of the arm and forearm, the deltoid region, the side of the chest between the axillary line and parasternal line, and the left side of neck. Although this region feels "icy cold," she declares that the skin is hot. There is often a feeling of dead weight with the cold.

Æt. 40. Climac. The left foot is often cold.

Æt. 41. Climac. The left arm and leg are often cold.

Æt. 40. Post climac. Suffers from feeling of heavy, cold weight on the top of the head, with headache.

Æt. 34. Irreg. Suffers frequently from a sharp stitch, and from a sensation of extreme cold in the precordial region.

Habitual Coldness.—Just as some people are habitually hot, clothing themselves lightly and seldom sitting near the fire, so there are others who find the

greatest difficulty in keeping themselves warm, and are very sensitive to cold. In extreme cases such individuals may shiver before the fire, or in bed, although a pile of bed-clothes cover them. The following are examples :—

Æt. 43. Climac. No flushes; is always cold; wants to keep near the fire; goes about the house with a woollen shawl, for she feels as if there were a continual draught about her.

Æt. 46. Post climac. Occasionally flushes; otherwise is always shivering, even when by the fire.

Æt. 38. Got wet 2 m. ago. Nothing since; has no flushes, but always feels cold.

The habitual tendency to cold is not uncommon at the climacteric and especially with women who do not flush at this period. This condition, like its opposite, *i.e.*, excessive sensitiveness to heat, is probably independent of the amount of heat produced within the body; it is not, that is to say, due to diminished production. Just as an individual may feel very hot even though the temperature of the body be not raised, so also may he feel very cold without any fall in the normal temperature; indeed, he may actually shiver when it is considerably above the normal, as in an ague fit. There can be little doubt that in this case the sensation of cold is due to constriction of the cutaneous arteries, and similarly it is possible that habitual coldness may be due to a like constriction.

Nature of the Sensation of Cold.—The patient often likens the sensation of cold to that which would be caused by "cold water trickling down the back" or "circulating through the veins;" sometimes she compares its intensity to that of ice or

frost. Often going near the fire or wrapping up warmly is described as unavailing. It is not uncommon for the patient to stand with the back to the fire to get warm, owing to the cold being so frequently felt in that region. I have even known a patient to go to bed to get warm.

Shivers.—When the cold sensation is severe the patient actually shivers, the shaking being sometimes as pronounced as in a rigor. One patient complained of shaking as "in an ague-fit." This condition must not be confounded with the tremor which so frequently occurs from weakness during the hot stage.

Condition of the Skin during the Sensation of Cold.—Just as when in an ordinary flush a sensation of heat is referred to any part, it by no means follows that the vessels of that part are dilated, so when a sensation of cold is referred to a part there is not necessarily any vaso-motor constriction. This is sufficiently attested by the case—by no means a single one—already cited, in which a large area of the skin felt icy cold although actually hot to the touch. Nevertheless, the cold stage of the storm we are considering is generally, perhaps always, characterized by a vaso-motor constriction of the cutaneous vessels, for during it the skin of the face may be observed to turn pale, and in severe cases the patients complain of the surface of the entire body becoming "goosey." Thus, the arterial constriction of the cold stage is more widespread than the arterial dilatation of the hot stage, since the evidence seems to point to the conclusion that such dilatation, as a rule, only takes place in exposed portions of the skin.

"Goose flesh" is said to be due to contraction of

the *arrectores pili*, and this condition probably goes hand in hand with the arterial contraction. We have still much to learn concerning the physiology of the sensation of cold. A sudden feeling of cold (as well as of heat) may, as we have seen, be quite independent of the condition of the skin—in other words, the cortical changes underlying the sensation may take place independently of specific influences ascending from the skin (= from the "cold spots").

We may here stop to ask if any explanation can be offered of the habitual order of the hot and cold phases; can we, *i.e.*, explain the fact that in nine cases out of ten the cold stage follows the hot? At first sight the explanation might suggest itself that the vaso-motor constriction which occurs during the cold stage is a sort of reaction from the vaso-motor dilatation occurring during the hot stage; but even if there were evidence of such reaction it is doubtful whether it would explain the peculiar sequence. The evidence, however, against such a theory is conclusive. In the first place the area of skin involved in arterial dilatation during the hot stage is limited, while the vessels of the entire cutaneous area are often contracted during the cold stage. Then, again, there is no necessary relation between the intensity of the hot and cold phases. A very intense heat, accompanied by marked dilatation of the vessels of the head and neck, may not be succeeded by any cold stage (= constriction of cutaneous arteries) whatever; and on the other hand, a very slight heat, in which no perceptible arterial dilatation occurs, may be succeeded by violent shivering. There being thus

no parallelism between the two stages, the one cannot be regarded as a reaction from the other.

Later, we shall see that an ordinary blush is very often succeeded by pallor of the face, and we can scarcely doubt that this pallor is analogous to the arterial constriction which attends the cold stage of the flush. The tendency of the face to blanch after a blush is—I may remark by the way—frequently brought out in lay writings, but nowhere better than in the following neat couplet by Racine :—

Je le vis, je rougis,
Je pâlis à la vue.

CHAPTER VI.

Symptoms of the Storm other than those referable to the Skin.—The changes taking place in the skin, and the sensations referable to this tissue, do not constitute the entire nerve-storm; on careful enquiry we obtain evidence that other and widely distributed parts of the body are also involved. The phenomena referable to these other parts, and which for convenience we may speak of as the "internal phenomena," occur chiefly during the hot stage, but, like the sweating, they stand in no fixed and unchangeable relation as regards time to this or the cold stage. They may, indeed, occur before the hot stage has developed, or may not appear until after the cold stage has subsided.

I now proceed to describe each of these "internal phenomena" seriatim, and after the description of each I shall indicate its relation in time to the hot and cold phases. We shall then see how independent of one another are the internal and external phenomena of the storm.

Classification of internal phenomena :—

- *Psychical.*
  - *Sensory.*
    - Faintness, feeling of weakness.
    - Suffocation, choking, desire for fresh air.
    - Numbness and other forms of dysæsthesia.
    - Nausea.
    - Pain.
    - Sensations referable to the eyeball and eyesight.
    - Tinnitus.
    - Giddiness.
  - *Emotional.*
  - *Intellectual.*
- *Motor* . . . . . .
  - Palpitation.
  - Paresis.
  - Tremors.
  - Vomiting.

These symptoms will often escape the physician unless he be on the look-out for them, for in the large majority of cases, the patient of her own accord tells us very little of her flushes, never spontaneously giving a succinct and categorical account of the whole storm. It not infrequently happens that some one or other of the symptoms attending the storm is so obtrusive that it alone is mentioned to us; nothing whatever being said about the feeling of heat or flushing of the skin which attends it. Over and over again I have heard patients complaining of sudden attacks of giddiness, faintness, or palpitation, which on enquiry I have found to be ordinary flushes. These symptoms are sometimes most distressing, so much so that the patient may be in constant dread of their recurrence. In the following description I shall not follow the above logical classification, but shall take the symptoms in their most convenient order.

Faintness, Weakness, etc.—The patient almost always feels faint or weak during some part of the storm, generally during the hot stage, this feeling being accompanied by actual muscular weakness. If standing, she may have to catch hold of something to prevent herself from falling; if occupied in work, she is compelled to leave off for a moment; if she chance to have anything in her hands, she may drop it; in rare cases she falls, only exceptionally faints away. The feeling of weakness is one of the most distressing symptoms of the storm; so overpowering may it be that the patient is often afraid to stir out of the house alone for fear of falling. The following terms were used to denote this feeling:—

Faint	in	137	cases.
Weak	,,	25	,,
Languid	,,	7	,,
Tired	,,	5	,,
Sinking	,,	5	,,
Exhausted	,,	3	,,

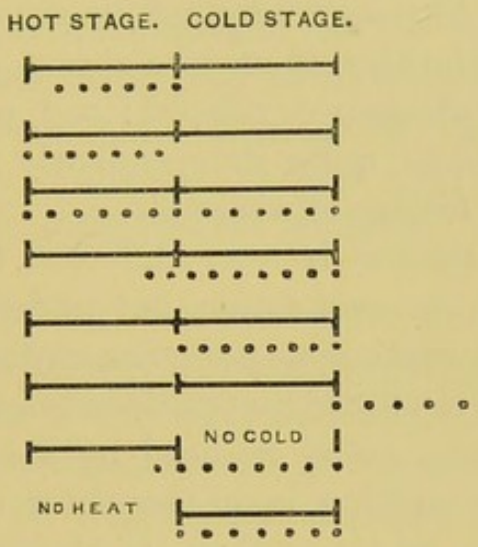
Other expressions used are "strengthless," "lifeless," "prostrate," "worn out," "confused," "limp," "collapsed," and "overwhelmed by a sense of impending death." (The latter feeling is perhaps distinct from the feeling of faintness.)

The sensation denoted by these various terms occurs as a rule simultaneously with the heat, but sometimes it is not felt until the heat begins to fade. It generally subsides when the cold stage arrives, though sometimes it continues during this stage, and may indeed actually then increase. In rarer instances it does not occur until the cold stage begins, and it may, as we have already seen, attend independent

shivers. Sometimes it is most felt after the cutaneous phenomena have disappeared.

The following diagrams, showing the relation which the feeling of weakness, faintness, &c., bears to the hot and cold stages, illustrate cases which I have observed, the dotted lines representing it and indicating by their relative length and position when the sensation was experienced in respect to the hot and cold stages.

FIG. 12.



It is therefore evident that the feeling of faintness may begin independently of the cutaneous phenomena. This is a fact of some importance. For since the faintness is chiefly felt during the hot stage, when there is, that is to say, dilatation of some of the cutaneous vessels, it might be thought that the resulting abstraction of blood from certain internal nervous structures was the cause of it. But the fact that there is in these cases no fixed relation between the vaso-motor condition of the skin and the feeling of faintness, obviously lends no support to this view.

Tremor.—During the feeling of faintness the knees are apt to tremble and give way, and sometimes the whole body shakes. This is the tremor of weakness, and is quite distinct from the shivering which frequently accompanies the cold stage, although it is possible that the two may sometimes occur together. The tremor in question is analogous to that of fear, and generally denotes a highly nervous state: every physician is familiar with the excessively nervous patient who is tremulous in every movement. Although very apt to occur during the feeling of faintness, it may be absent when this feeling is most intensely developed; and, on the other hand, it may occur quite independently of flushes or of a distinct feeling of weakness.

This tremor is very different from convulsion; there is not over-action, but under-action, *i.e.*, paralysis. A continuous muscular contraction consists of a series of rhythmic contractions fused into one (=tetanus), these being induced by a series of rhythmic impulses striking upon the motor end-organs of the muscular fibres. Now, is tremor an imperfectly developed tetanus? Any diminution in the intensity or rapidity of the efferent nerve-shocks issuing from the motor-ganglia would tend to an imperfect tetanus —to a discontinuous, as distinguished from a continuous, contraction—*i.e.*, to tremor. This tremor would naturally affect mainly those muscles which are most contracted, but on this hypothesis all the muscles of the body might be to a certain extent affected, since the most relaxed muscles are more or less contracted, *i.e.*, in a condition of so-called "tone."

The trembling is described in such terms as the following :—

Feels "all of a tremble" and her knees shake under her.
Knees tremble from weakness.
Trembles "like the leaf of a tree."
Has trembling, and a nervous, faint feeling.
Shakes all over, but does not feel cold.

The tremor generally occurs during the hot stage ; sometimes, however, it precedes the dermic phenomena, sometimes it occurs during their subsidence, and it is by no means uncommon for the patient to be "all of a tremble" after they have completely disappeared, the tremor then making its appearance for the first time. Thus, one patient complained of "shaking all over" after the hot faintness.

Suffocation, Stifling, the Desire for Fresh Air, Choking.—I have notes of 45 cases in which a feeling expressed by some one or other of these terms was complained of in connection with the storm. They probably all refer to what is fundamentally the same feeling, the essential feature of which is the craving for fresh air, as the following expressions indicate :—

Cannot get enough air.
Must have fresh air.
Has to rush to the window or to the door.
The ceiling seems too low ; would like to open all the windows and take the roof off.
When the flush occurs in bed, must throw all the clothes off or would be stifled.

Sometimes the sense of suffocation is so great that the patient feels as if she were going to die.

Æt. 39. Climac. Very ill nourished. Has flushes which spread upwards. She then feels faint and exhausted, and has a suffo-

cative feeling as if she were going to die, with a craving for fresh air and cold water; after a time breaks out into a cold perspiration. She lives in constant dread of these attacks, and fears to go out on their account.

Often a feeling arises aura-wise from the chest, and when it reaches the larynx is felt as a choking.

Æt. 34. Flush begins as a rising from the chest which causes a choking sensation.

Æt. 38. Post climac. Flush begins as a rising from the chest which causes a choking, making her speak quite hoarse as if she had a bad cold (= laryngeal paralysis).

Æt. —. Climac. Has a stifling feeling during the flush, as if her breath would not come freely; she then feels as if some one were holding her throat.

It is difficult to say whether this choking feeling, and the sense of suffocation or desire for fresh air so frequently complained of during the flush, are absolutely the same. Both are referable to the respiratory sensorium. Probably the difference is somewhat the same as the difference between the sensation felt on breathing an insufficient quantity of air (= suffocation) and that due to some actual obstruction of the larynx (=choking), the one being a purely diffused sensation, the other to a large extent localized. In some cases the laryngeal muscles are evidently affected.

It is well known that a choking sensation is often experienced during palpitation or other disordered action of the heart, and the hypothesis at once suggests itself that the feeling may be due to imperfect oxygenation of the blood, resulting from inadequate heart action. How far the feeling of suffocation experienced in a flush is also traceable to the heart it is difficult to say. In 13 cases my notes

make mention both of the condition of the heart and of the presence or absence of this feeling. Thus—

7 Palpitation, suffocation.
4 Palpitation, no suffocation.
2 No palpitation, suffocation.

13

From this table it would appear that the feeling of suffocation may occur independently of any peculiar condition of the heart. It is important to observe that there may be palpitation without suffocation; possibly the heart does not always act with equal inefficiency in every case of palpitation, and this may account for the absence of suffocation in some cases. The fact that suffocation may occur without palpitation seems to show that the condition of the heart has no relation to the feeling; the mere absence of palpitation does not, however, prove that the heart is acting efficiently.

In instances like the following the feeling of breathlessness is probably connected with some peculiar condition of the heart or its nervous system:—

Æt. 37, less 6 m. Has suffocative pressure on the breast bone; feels then as if she could not breathe, and as if her heart would stop. These feelings may occur with or without the flushes.

Æt. 54. Post climac. After flushes has dreadful pain at heart; feels then as if she were going to cease breathing.

The feeling of suffocation almost always occurs during the hot stage; it may, however, extend into the cold stage, and sometimes, though rarely, it occurs during the cold stage only. It may also accompany independent shivers.

Several questions here suggest themselves: Is this feeling of suffocation due to disturbed vaso-

motor action of some part of the respiratory nervous system? Are the blood-vessels supplying the central nervous system thrown, like those of the skin, into disordered action? Does the determination of the blood to the skin lead to an insufficient supply to internal parts?—questions that we cannot answer, seeing that the vaso-motor condition of the skin is no index of that of internal parts, and that the feeling of suffocation may occur during diametrically opposite conditions of the cutaneous blood-vessels,—during both dilatation and constriction, and also without any alteration in them. All that we can say for certain is that the highest sensory and motor centres of the respiratory nervous system are exceedingly sensitive, and that they are very apt to be involved in nerve-storms. Both are strongly affected in emotion; they are therefore, in the emotional, frequently the seat of the explosions, and it is no wonder that in this class they should be liable to spontaneous discharges.

Palpitation.—That the heart should be implicated in a vaso-motor nerve-storm is only what might be expected, seeing that its nervous mechanism is intimately associated with the vaso-motor system. Palpitation very frequently attends the hot stage, and this accords with the physiological fact that the rate of the heart-beat is in inverse proportion to the degree of arterial blood-pressure, which, during this stage, is generally lowered. On the other hand, in a very considerable number of cases there is no palpitation whatever; the rate of the pulse is however generally increased.

Nevertheless, there is certainly no necessary connection between palpitation and flushing, for it frequently occurs without any flush, and, as just remarked, the reverse may happen. Moreover, as we shall presently see, the palpitation, when it does occur in connection with the storm, bears no fixed relation to the hot and cold stages.

In some cases it would appear as though a neurotic condition of the cardiac nervous system were the primary element in the storm, the vaso-motor phenomena being secondary and subsidiary.

Æt. 40. Climac. The flushes start in the cardiac region with palpitation, spread up the left side of chest to left side of head, then work down the arms (chiefly down the left one ?).

Æt. 46. Climac. Can always tell when the flush is coming on by a peculiar feeling round the heart.

Æt. 28, less. Complains of dreadful palpitation during which the whole body flushes.

Other cardiac conditions besides palpitation may be complained of:—

Æt. —. No palpitation, but "working" of the heart during the flush.

Æt. —. Feeling during flush as if heart would stop.

Æt. —. Has to hold heart, which feels as if it were too large, and is painful. (In this instance the cold stage preceded this feeling, which occurred both during it and the succeeding hot stage.)

As regards the relation in point of time of the palpitation to the hot and cold stages: it may herald the attack; it may occur during the hot stage or just as it is subsiding; it may accompany the cold stage, and also independent shivers; finally, it may occur after the dermic phenomena have disappeared.

It may here be remarked that palpitation may

constitute part of an epileptic aura. In this case the discharge certainly starts in the cortex, wherein are situated cardiac centres; the like may also be true of the palpitation occurring in connection with a flush.

Nausea and Vomiting.—Nausea is complained of in a large number of cases, but vomiting is exceptional. Seeing that dyspepsia is often the exciting cause of a flush, we should rather expect to find nausea—itself a common symptom of dyspepsia—occasionally present; and in truth the gastric condition with its attendant nausea must often be regarded as primary, the flush and the cutaneous phenomena merely secondary, the nausea then belonging rather to the dyspepsia than to the flush, as in the following cases:—

Æt. 58. Post climac. Dry flushes after meals. As the flushes are leaving her, nausea and vomiting frequently occur.

Æt. 26. Suffers from pre-menstrual dyspepsia; flushes then after food. The flush lasts for about half-an-hour; she then vomits and the flush subsides.

It would nevertheless appear that in very many cases the nausea is an actual symptom of the flush, *i.e.*, occurs independently of a primary dyspepsia, much as the sickness which so frequently accompanies an ordinary faint may. The following are examples:—

Æt. 43. Climac. The flush spreads up from the epigastrium; during the cold stage retches and brings up foam.

Æt. 20. Chlorotic. No flushes; suffers from shivers; she then feels sick and low-spirited, and sometimes has a stifled feeling.

Æt. 46. Climac. Moist flushes terminated by shivers; often nausea after shivers.

Æt. 46. Climac. Flushes, sweats with, then shivers; nausea while hot.

The nausea may occur during the hot stage, during the cold stage, or after this latter; it may also occur in connection with independent shivers. I have notes of two cases in which a flush followed retching.

Pain.—Sometimes the attacks are attended by pain. Out of 24 such cases the pain was in 11 referred to the chest or epigastrium. In some of these it was manifestly dyspeptic.

Æt. —. Climac. Suffers from burning sensation in stomach, and pain, accompanied by flushes.

Æt. 58. Post climac. Pain in the chest with anything she eats, but especially after tea. This pain, in her opinion, causes the flushes.

In other cases the pain in the chest accompanying the flushes is of more doubtful origin, as in the following:—

Æt. 30. Nursing 12 m. Pain in the left side as if a pin were sticking into her, with palpitation; the throat then feels swollen and there is difficulty in breathing and a sense of impending death. She flushes during these feelings, sweats, and is cold after (= anginoid attack).

In such cases it is difficult to say whether the flush is a direct consequence of the pain (or rather of the nervous processes underlying it), or whether pain and flush alike are results of some common nervous state behind both, so to speak. In most instances of dyspeptic pain the flush is probably secondary.

In the following cases the pain occurred in other situations than the chest and epigastrium, the flush being secondary:—

Æt. 45. Post climac. Has dry flushes with rheumatic pains in joints.

Æt. 70. Suffers from sharp pain in the occiput, with faintness and flushes.

Æt. 60. Ill-nourished, anæmic woman. Suffers from neuralgic pains in different parts of the body; when these occur, has hot sweats from head to foot and trembles; there is no shiver. The heats last after the pain has gone.

Probably any severe pain is capable of causing a flush in a predisposed subject; some patients, however, even at the climacteric, suffer the most violent pains without flushing. Thus—

Æt. 40. Climac. Suffers from lancinating pains in the head, but never flushes.

Although nervous women frequently suffer from both headache and flushes, the two must be regarded as separate, and more or less independent, phenomena; for not only may the patient suffer from the one without ever experiencing the other, but when both occur in the same subject, they are by no means contemporaneous; the patient may, for instance, suffer from headache one day and from flushes another. Moreover, it should be remembered that a flush is for the most part a thing of the moment, while headache may last a long time. I mention this because some seem inclined to attribute headaches to vaso-motor conditions, and it is evident that the above facts, though they do not disprove, certainly lend no support to this view.

The pain generally occurs at the beginning of the storm; it may, however, follow it. Thus—

Æt. 52. Post climac. Every month heats pass up the front of the body; she sweats with them, and shivers after in back of trunk and neck; with the cold a shooting pain passes up the spine along the right side of the head to the right eye; also gets this shooting independently of the flushes.

Æt. 25 (man). Suffers from headache after the flushes.

Æt. 57. Post climac. Flushes pass up from the stomach; sweats with, shivers after; then has a cramp-like pain in upper arms, and "stitch" in chest.

Æt. 66. Flushes, sweats, shivers; then has "dreadful pain at the heart," with feeling of suffocation.

Pain is not infrequently associated with shivers. I have sometimes, for instance, noticed headache attending them, and I observe that out of 12 epileptic auræ in which there was headache, Gowers noticed shivering in 3.

Numbness, "pins and needles," Smarting, Tingling, etc.—Numbness, or "pins and needles," is not infrequently complained of in connection with the flush:—

Æt. 44. Climac. Has pins and needles in fingers and sometimes in feet, or the entire body; this may occur either before or with a flush; occasionally the flush begins with pins and needles at the heart.

Æt. 57. After flushes has cramp-like pains in arms, with pins and needles in the hands. Feels then as if she must squeeze the arms.

Æt. 40. Climac. Flush works up the back between the shoulders and over the head to the face; when the lips are reached she experiences a sensation of pins and needles in them, turning at the same time faint; sweats with, shivers after.

Æt. 44. Climac. Flushes generally begin in the nape of the neck, passing over the scalp, and down the body, sometimes as far as the feet, when she experiences a "fidgeting" across the toes.

Æt. 55. Post climac. Ascending flushes, with faintness and palpitation; after the flushes, "dreadful crawling and tingling" sensation over head and face.

Intense congestion of the vessels of the face during the hot stage may lead to smarting or burning in which the eyes sometimes share, and, less frequently,

the mouth and throat. Sometimes a tingling is felt all over the body, and this may even occur in an ordinary blush.

Symptoms referable to the Eyes.—Affections of the eyesight are not uncommon during the hot stage of the storm. Of these, dimness of vision is most frequently complained of. One naturally asks whether such dimness may not be due to vaso-motor changes in the visual nervous system. So far as the retina is concerned I have not hitherto been able to detect any such change. As throwing light on this question no cases are so instructive as unilateral flushes, and of some half-dozen which I have examined, in one only was I able to discover any difference in the vessels of the two sides. In it there was unilateral redness of the face, attending facial neuralgia, and the case can therefore scarcely be regarded as a true flush. Be this as it may, the disc and retina of the affected side were distinctly redder than on the opposite side. In this connection it may be observed that in the flushing induced by nitrite of amyl there is dilatation of the retinal vessels in both eyes.[1]

The dimness of vision is not infrequently described as a film of mist in front of the eyes. Sometimes the patient complains that "all objects look black," or that she "is almost blind." One patient spoke of "a watery, dazzling feeling" in the eyes during the heat; another of "live blood," as though "some-

[1] See "The Ophthalmoscope in Mental and Cerebral Disease," by C. Aldridge: "West Riding Asylum Reports," 1871–2, p. 94.

thing alive were moving backwards and forwards in front of the eyes"; a third "saw stars"; a fourth, "many coloured balls."

Diplopia was present during the flush in two cases. It resulted, I presume, from a temporary weakness of the centres concerned in "fixing" the object.

In all the above cases the vision was affected during the hot stage, and during the hot stage only.

Giddiness, Tinnitus.—There is seldom an actual sense of rotation during the storm, and true vertigo I have never met with in these cases, but simple giddiness is frequently complained of—such terms as giddy, dizzy, swimming, being used to designate the sensation. In some cases the feeling is most probably one of mere confusion; in most, the patient feels as if she would fall, and occasionally there are symptoms of the kind already alluded to, referable to the eyes. Tinnitus I noted in one case only. In those few cases in which there was a sense of turning this was as often to the right as to the left.

It must be remembered that attacks of giddiness frequently occur in nervous women independently of flushes. They may be so severe as to cause the patient to reel, or actually to fall down, in which case she is often afraid to trust herself out alone. Such attacks are very common at the climacteric.

Giddiness, when occurring in connection with a flush storm, is for the most part felt during the hot stage. In the following case it was most marked when the perspiration occurred, showing that this does not necessarily cause relief, as Tilt would seem to imply.

Æt. 69. Flushes every month. After the flush has been out some time she feels faint and has a swimming in the head; is most giddy when perspiration occurs, *i.e.*, some time after flush makes its appearance.

Emotional and Intellectual.—The storm, besides expressing itself in any of the unpleasant *sensations* we have just considered, may lead to a peculiar emotional or intellectual state, that is, to a much more elaborate and complex mental state. By far the most common emotion is despondency or lowness of spirits, the patient feeling unhappy and inclined to cry, sometimes actually bursting into tears. The following cases illustrate this condition :—

Æt. 37. Very anæmic. Nursing 11 m. Flushes, sweats with, shivers after; often feels inclined to cry during the heats, and sometimes actually bursts into tears.

Æt. 27. Last child 4 years ago. Regular in time, irregular in quantity. Suffers from a complex dermic storm. Flushes, sweats, shivers. During the same feels as if she "could sit down and have a good cry." As soon as the storm is over she completely recovers her spirits.

The following cases illustrate other emotional states :—

Æt. —. Climac. Shivers, then flushes, then sweats. During the flush feels quite hysterical. Has stifling, choking sensation, which seems to prevent her for a time from crying; when she has cried, feels relieved.

Æt. 41. Climac. Flushes seem to begin as a fluttering in the left side; they pass up the left side chiefly to the head. She feels then as if she had been frightened—startled—as if some one had told her some dreadful news; shivers after. (Cardiac aura?)

Æt. 49. Post climac. Flushes, sweats, shivers after. When flush is on feels bad tempered—as if she "could hit anybody."

Or the emotion may be of a more vague kind :—

Æt. —. Hot, sweats, shivers. During hot stage feels as if she could jump out of bed and "do anything."

In the following case there was intellectual alteration :—

Æt. 52. Post climac. Flushes, sweats, no shivers. "Fancies such strange things during the heats."

The emotional alteration generally occurs during the hot stage. One patient complained of despondency before the flush came on; a second felt inclined to cry while the flushes were going off; a third always felt as if she must cry when the flushes had passed, but "pulled herself together" and checked the inclination.

It ought not to surprise us that an emotional condition frequently attends the storm, seeing that the storm involves to a very large extent those parts (="nervous arrangements") of the sensori-motor nervous system concerned in emotional ebullitions. Sensations starting at the chest or epigastrium with palpitation, and rising up to the throat, with a feeling as of "a lump" or stifling feeling here, are common in emotional outbreaks, and more especially in those of the depressing kind. Thus, the expression "stifling grief" is frequently met with in writers of fiction. This very day I came across the words—"he felt a rising in his throat," in a novel. The stifling feeling which may precede or accompany an outburst of crying is well brought out in one of the cases just quoted. Seeing, therefore, that many of the visceral manifestations of grief may attend a flush storm, we ought not to be surprised at some depressing emotion sometimes occurring. It is well known to psychologists that if an individual imitate the physical expression of a particular emotion, the emotion

itself tends to be excited, so that the mere occurrence of the above visceral conditions would tend to excite emotion, although I am far from saying this is the usual sequence in those emotions which accompany the flush storm. Indeed, in one of the above cases, the emotional state preceded the flush.

* * * * *

It may here be observed that all the various symptoms just passed in review—nausea, vomiting, palpitation and other cardiac phenomena, suffocation, stifling, tingling, burning, numbness, giddiness, tinnitus, interference with vision, various pains and emotional and intellectual states, may form part of the epileptic or hysterical aura. A perusal of Gowers' book will make this clear. That they stand in no fixed and definite relation to the dermic manifestations of the storm has been amply brought out. They occur, as we have seen, for the most part during the hot stage, either at its commencement, or a short time after its appearance, and as a rule they cease when the cold stage arrives, but they may continue into it. This is true of such a symptom as suffocation, otherwise so characteristic of the hot stage. In rarer instances the unpleasant symptoms do not make their appearance until the cold stage.

We must therefore regard the dermic phenomena, and these other manifestations of the nerve storm as co-results; we cannot, that is to say, attribute the latter (if we except such symptoms as burning and smarting) to the mere determination of blood to, or the abstraction of blood from, the surface. Nor can we attribute them to independent vaso-motor dis-

turbance of more deeply-seated structures. The vaso-motor disturbance of the superficial vessels indeed suggests disordered action of the more deeply seated ones, but how far such is the case it is impossible to say, for the vaso-motor condition of the superficial vessels gives us little or no indication as to the state of those hidden from our view. It is only by remote inference, by careful reasoning founded upon laborious observation, that we can arrive at the truth. No one argument, as we have seen, can be brought forward in favour of the "internal phenomena" being due to vaso-motor change, while there are many which point to the opposite conclusion.

CHAPTER VII.

Times at which the Storm occurs.—The attacks may occur during the day only, during the night only, or during both the day and the night. Out of 67 cases they

In 16 occurred during the day only.
2 „ „ night only.
49 „ „ day and night.

Of the 49 cases of attacks occurring both day and night they

In 19 occurred chiefly during the day.
20 „ „ „ night.
10 not mentioned whether chiefly night or day.

In some of the above cases, the patient may have meant by "night" simply "after dark," that is to say, either the evening or bedtime, but certainly the expression was used in most instances to denote the latter. When the attacks occur during the day they may show a predilection for certain hours. Thus, with some they are worst in the morning, which of all times is the most unfavourable for the nervous, explain this who can ; with others they are worst after meals, being in fact determined by them ; sometimes they occur in the afternoon chiefly, and very frequently they are complained of most in

the evening. This is perhaps more particularly the case in winter, when sitting-rooms are apt to be hot and stuffy.

When the flushes occur in bed, they are often—indeed generally—attended by profuse perspirations, and it was, in fact, chiefly in these cases of night flushes that the patients complained of being wringing or dripping wet, of lying in a pool, or of being bathed in boiling water—as already quoted. Some patients attribute, and perhaps correctly, these excessive night sweats to the warmth of the bed.

Why the flush should in some cases occur chiefly or solely at night, and in others chiefly or solely during the day, it is impossible to say. The like uncertainty as to time is noticeable also in other neuroses—*e.g.*, epilepsy. In two of my patients the flushes occurred chiefly during the act of falling asleep. The transition state between waking and sleeping, and that between sleeping and waking are, as Marshall Hall long ago pointed out, apt to be attended by many curious nervous disturbances. Weir Mitchell has more recently insisted upon the same point. It has been pointed out that epilepsy may occur while the individual is falling asleep (Gowers).

A patient may be awakened out of sleep by a flush (as by other forms of nervous disturbance), notably so when it is accompanied by marked choking or suffocation. Probably the attacks sometimes occur during sleep without waking the patient, but this is not easy of proof.

When the storm occurs in bed, the hot stage is generally more pronounced than the cold ; not uncommonly, however, the cold stage is well marked then,

and sometimes independent shivers occur, and this in spite of the heaviest covering. Every one knows how frequently cold feet in bed are complained of.

Number of Attacks.—The number of attacks which an individual may suffer in the twenty-four hours varies from one to a hundred or more. As a rule, however, they do not recur more than two or three times a day. The following cases are examples of oft-recurring heats :—

Æt. 48. Post climac. Flushes pass up from the feet to the trunk and face, and run down the arms and hands; "they keep coming like this;" before they reach the end of the fingers they start again.

Æt. —. Climac. Hot flushes every minute; start in chest and spread upwards; the patient declares she "must have a hundred a day."

The number of attacks, as is the case with all nervous paroxysms, varies from day to day and from week to week. The patient may go for days or weeks without a flush, and then perhaps suffer for a time from constant attacks.

Variability.—Like everything else pertaining to life, all nerve-storms show a tendency to vary in character. In epilepsy, in megrim, in asthma, the seizures differ from time to time and as the years roll on, and although there is a general likeness between successive attacks of the same storm, it may nevertheless be safely affirmed that no two have ever been exactly the same. In all organic phenomena there is a constant tendency to variation from a specific type, both as regards structure of organisms and as regards their functional mani-

festations, amongst which latter nerve-storms must be classed.

There is no occasion to show in any detail how the nerve-storms we are considering may vary in the same individual. It is sufficient to state that they do vary in every detail,—in the number, the character, and the order of the cutaneous and other phenomena. This variation may be well observed in the post-climacteric years when a gradual dwindling of the various phenomena may often be observed from month to month, or from year to year.

This is a fit place to remind the reader how especially liable the nervous patient is to vary in health without obvious cause,—a tendency particularly marked in the well-nourished and healthy-looking neurotic, of all nervous patients the most difficult to cure. A patient of this kind varies in the most extraordinary and unaccountable way from time to time: one day he feels well and vigorous, capable of "doing anything"; the next he is weak and languid, the victim of countless aches, pains and anomalous sensations. Doubtless subtle climatic and telluric changes may account in some measure for this irritating uncertainty in nervous function, but often enough such external influences may be practically excluded, and we must therefore seek for some fundamental weakness in nervous organization as the cause of the peculiarity. In such cases the foundations of the nervous system have been ill-laid. Either the great shaping power of structure—heredity—has been at fault, or there has been some imperfection in the environment. I attach, however, greatest importance to the former in these cases, for I believe that in practically all

of them a family history of some serious imperfection of the nervous system may be elicited.

Far otherwise is it with the thin-blooded, emaciated neurotic; although there may be hereditary weakness in such cases, yet the poorness of nutrition alone will almost certainly, especially in women—be the constitution never so strong—call forth a long train of morbid nervous phenomena. Here again, as in the former cases, we may observe fickleness, but we shall find that the nervous health is much more closely dependent upon the general health, rising or falling with it with remarkable parallelism. By enriching the blood and increasing the body-weight the symptoms are made to vanish.

Between these two classes of nervous patients it is necessary to make a strong distinction.

CHAPTER VIII.

The causes of flushing may be grouped as follows :—

Predisposing : a. Age.
b. Climacteric.
c. Menstruation.
d. Menstrual irregularities.
e. Sex.
f. Pregnancy.
g. Lactation.
h. Chlorosis.
i. General debility.

Exciting : a. Emotion.
b. Indigestion.
c. Heat.
d. Acute affections.
e. Organic diseases.

Predisposing Causes.—*a.* Age.—Flushes may begin many years before puberty, and they may occur years—ten, twenty, thirty or more—after the climacteric. These two great epochs in the woman's life are neither of them co-extensive in time with the menstrual irregularities which attend them. A peculiar irritability of the nervous system manifests itself long before the first menstruation occurs and continues for some time after the periods are regularly established ; and similarly, for many years before and

after the climacteric irregularity, the nervous system is irritable and prone to a host of minor functional disorders. Börner[1] is careful to insist upon this non-correspondence in point of time between the advent and cessation of climacteric nervousness and the period of menstrual irregularity, and I can fully bear out his remarks on this head.

The earliest age at which I have noted flushes is 10 years, the latest, 80 years; but I doubt not that they may occur both earlier and later in life.

b. The Climacteric.—This is *par excellence* the period of flushes. No doubt the menstrual irregularity which occurs at this time takes some part in evoking the characteristic flushes, for such irregularity is, as we shall presently see, a very potent cause of them, but we must go further back than this in order to fully account for their frequency.

During the climacteric important changes take place in the nervous system, and the tendency which is then displayed to flushes and other manifestations of general nervousness is the expression and outcome of those changes. That this irritability of the nervous system—this tendency to functional derangement—is more or less independent of menstrual irregularity is shown by the fact, already observed, that it begins to manifest itself some time before there is any discoverable alteration in the menstrual rhythm. I am unable to fix with any exactness upon the starting-point of this curious wave of nervous irritability. It begins insensibly, let us say at 35 or 36, and gradually increasing from

[1] "Die Wechseljahre der Frau," von E. Börner. Stuttgart, 1886.

year to year, reaches its maximum with the distinct establishment of the climacteric irregularity. Any one who carefully studies the workings of the nervous system in woman, will observe this change gradually and all unknown to herself creeping on through a number of years much as puberty does. Indeed, there is nothing stationary in the life of an individual. Some are apt to think that between the periods of full maturity and of distinct bodily decay, the organism remains stationary. But a little thought will show the complete fallacy of this view; were it so, the individual might go on living for ever, whereas he is never one day exactly what he was the day before: he is a day older, a day nearer the grave—which simply means that the structural changes which go to make up the grand rhythm of life have made one step more in advance along the cycle. We must not therefore regard the nervous system of the woman as the same between the period of fully developed womanhood and the advent of the climacteric irregularity; we must, on the contrary, think of it as all this time undergoing steady change. Any one, I repeat, may test the truth of this remark by carefully studying the latter half of the third decennium in woman, when, among other evidences of nervous irritability, flushes often begin to make their appearance.

The independence of this irritability at the climacteric of menstrual irregularity was well shown by a patient of mine who had never menstruated. During the ordinary age at which the climacteric approaches, this woman, who was very full-blooded, suffered from the most pronounced nervousness, and

more distressing flushing I have never seen. I say this patient never menstruated, nor did she, in the ordinary sense of the word, *i.e.*, in the sense of losing blood every month; but who shall say that she never menstruated in the sense of passing through a monthly cycle? The mere loss of blood, or even the ripening of an ovum, constitutes only part of menstruation. The menstrual rhythm is *continuous*, as every cycle must be; wherefore a woman is always menstruating, just as the moon is always moving, so-called menstruation forming only part of the cyclical changes. I should for this reason be very reluctant to assert that this woman never menstruated. Certainly her nervous system passed through that grand crisis which in normally menstruating women marks the cessation of so-called menstrual life; else why should she, at that period of life at which menstruation is wont to become irregular, manifest the train of nervous phenomena which are characteristic of it?

c. Menstruation.—There is, beyond all doubt, a distinct connection between menstruation and flushes. This is incontestably proved by the fact that they are very apt to occur at the menstrual period. Thus such cases as the following are not infrequent:—

Æt. 45. Flushes for two or three days before each period; upon the appearance of the menstrual flux the flushes cease.

The connection between flushing and menstruation is further shown by that large class of cases in which flushes occur every month after the woman has ceased to lose blood from the uterus. It is probably not generally known how common these

post-climacteric monthly manifestations are. I am indeed somewhat inclined to think that they occur in every woman to the end of life. Be this as it may, there can be no doubt that they do occur in most women during the first years of post-menstrual life, and this fact bears out the remark just now made that menstruation does not merely consist of ovulation and a discharge from the uterus. I have seen a large number of post-climacteric menstrual flushes. The following are examples :—

Æt. 58. Nothing 7 years. Has a distinct monthly indication, consisting of flushes which are attended by sweats, choking, palpitation, &c.

Æt. 49. Has only once menstruated in 13 years. Has cold shivers every month. These are preceded by a slight flush. During shivers is faint and giddy.

Æt. 69. Nothing 14 years. Flushes every month; during the flush is faint and dizzy.

d. Menstrual irregularities.—In the vast majority of those flushes which occur during menstrual life, there is some irregularity in the menstrual process. Whenever menstrual irregularity occurs, flushes are apt to supervene.[1] The connection between menstrual irregularity and nervousness is well known, and it has been deeply impressed upon my mind during the investigations on which this monograph is based. We must not on this account conclude that the irregularity is in all cases the cause of the nervousness, for it and the nervousness may each be the result of a common cause ; but even when so,

[1] By menstrual irregularity I mean any alteration in the length of the menstrual rhythm, or in the quantity of blood lost. It is always necessary to enquire into the latter particular, since many patients will declare themselves to be regular if only they are regular in point of time.

the menstrual irregularity would tend to aggravate the nervousness, and must therefore be recognized as playing some part in its causation. That such irregularity is competent to cause nervousness is amply proved by the fact that a woman hitherto enjoying perfect health will almost certainly suffer a long train of nervous symptoms if menstruation is suddenly suppressed by some morbid influence, the latter being of itself—it may be—incompetent to produce the nervous phenomena.

Having thus established a distinct connection between flushes and menstruation we may now seek its explanation. The following does not profess to be any more than a very partial one.

1. First, as regards the post-climacteric menstrual flushes. The normal monthly loss of blood necessitates a monthly vaso-motor change. In what exactly this change consists has not been determined, but this much we know: there is a general rise of arterial blood-pressure. The significance of this rise seems to me unmistakable. The most effectual method of increasing the quantity of fluid eliminated by the renal glomeruli is by a contraction of all the arterioles of the body except those of the renal artery. As a result of this, the general arterial blood-pressure goes up, for the resistance to the onward flow of blood being increased, the heart has to oppose a greater force to the column of blood.[1] The general capillary blood-pressure, however, is not raised under these circumstances, but, if anything,

[1] An increase in the general arterial blood-pressure can only come through the heart, a fact which physiologists do not seem to make plain. See Part I.

diminished, because the extra force with which the heart meets the extra resistance is spent (and perhaps more than spent) in overcoming that resistance. By a dilatation of the renal arterioles, however, there is a diminution of the resistance to the onflowing blood in this vascular area; wherefore, with an increased propelling force and diminished resistance, the capillary blood-pressure rises here. There is, in short, no more effectual way of raising the pressure in any local, capillary area than by causing a dilatation of the arteries leading to that area, and a contraction of all the remaining arteries. Exactly the same kind of vaso-motor changes occur, I take it, during menstruation. That the general arterial pressure is raised we know, and this is certainly brought about by a general arterial contraction; we have only to imagine a dilatation of the arteries supplying the uterine mucous membrane, and we have all the conditions necessary to capillary rupture. (This rupture, I can well imagine, is aided by degenerative changes, wrought through the medium of special trophic nerves.) If this explanation be correct, we can understand those comparatively common cases in which the so-called vicarious menstruation occurs. For to account for the abnormality we have only to suppose the vaso-motor dilatation of some area other than the uterine, the latter remaining contracted. Monthly epistaxis with no uterine loss *e.g.* is certainly not rare. In these cases we may suppose that certain nasal vessels have acquired the habit of dilating in place of the uterine vessels. But such vaso-motor changes, taking place in a normal menstruation, must be further supplemented by changes having for

their object the maintenance of the arterial blood-pressure at a certain mean level otherwise interfered with by the continued loss of blood.

Wherefore the menstrual rhythm includes among its phenomena a certain vaso-motor rhythm. And when we find the periods frequently heralded by important vaso-motor changes (as in flushes), when, moreover, the same tendency to rhythmical vaso-motor change occurs steadily month after month in the post-menstrual life, the question naturally arises: Is there any connection between this vaso-motor rhythm, and that which belongs to normal menstruation? Have we not in such flushes an example of perverted menstrual vaso-motor rhythm?

2. Similarly, in the flushes which attend menstrual irregularities there is interference with the monthly vaso-motor rhythm. What wonder then—it may fairly be argued—that this system should run riot, so to speak, and express its confusion in the development of certain vaso-motor nerve-storms.

That the views just enunciated only in a very remote degree explain the connection between menstruation, normal and abnormal, and flushes, if indeed they explain it at all, is evident from the following considerations:—

a. Menstrual irregularities may occur without flushes. The following are examples:—

Æt. 16. Nothing. No flushes.
Æt. 42. Less 1 yr. Irreg. in time 7 m. No flushes.
Æt. 46. Nothing 4 m. No flushes.
Æt. 19. Chlorotic. Losing very little. No flushes.
Æt. 34. Menorrhagic. No flushes.

In cases of this kind attacks of coldness are not

uncommon, and these attacks are probably generally due to vaso-motor constriction, *i.e.*, to erratic vaso-motor action. Thus :—

Æt. 38. Sudden cessation through cold. No flushes, but feet cold.

Æt. 43. Reg., but little. No flush, but suffers dreadfully from shivers; her feet are always cold.

I am inclined to think almost all cases of menstrual irregularity are attended by some abnormal vaso-motor action. I say almost, for in some there is no history either of flushes or of coldness.

b. Flushes may occur independently of menstrual irregularities.

Æt. 48. Says she is perfectly regular in time and quantity. Has flushes.

Æt. 45. ,, ,, ,, ,, ,, ,,

Æt. 47. ,, ,, ,, ,, ,, ,,

These three cases emphasize the fact already insisted upon that there is a special tendency to flush at the climacteric independently of menstrual irregularity.

c. It is probable that a so-called flush is not primarily a vaso-motor nerve-storm, but that, as in epilepsy, the vaso-motor phenomena are secondary. This conclusion has already been hinted at several times, and it will be further alluded to under the head of pathology.

e. Sex.—It is needless to say that flushes are much more common in the female than in the male sex. They do, however, frequently occur in the male, in conjunction with the same expressions of general

nervousness met with in the female. We have seen how commonly flushes attend sexual irregularities in the female, and it is interesting to observe that when they occur in the opposite sex, irregularities of the sexual system are frequently present.

It would therefore seem as though flushes were distinctly related to functional disturbance of the sexual system in both sexes. In the male this tendency bears no relation to blood loss. Nevertheless, I have seen one case in which the flushes were distinctly related to such loss. It is, I think, of sufficient interest to be described at length.

Æt. 62. Full-blooded man of vigorous intellect. During the last 20 or 30 years has suffered a monthly hæmorrhoidal flux. So regularly has it occurred that he speaks of these periods as his "monthlies." Far from feeling any evil effects from the bleeding, he invariably, and especially of late years, experiences great benefit from it, the improvement expressing itself in increase of intellectual vigour and more perfect bodily health. Two years ago, the flux ceased to appear regularly, and then, curiously enough, he began to experience a long train of minor nervous symptoms such as occur at the climacteric. He suffered from constant flushes of heat during which he felt "groggy." These heats ascended and were attended by palpitation. He further suffered from marked tenderness of the scalp, and became highly emotional, in fact almost hysterical. All these symptoms were wonderfully relieved by the sudden occurrence of a profuse hæmorrhage, which luckily occurred on the eve of an important meeting at which he was to preside. For weeks before, he had been dreading the occasion, brooding over it by day and night, but with the loss of blood his confidence in himself returned in large degree, his head cleared, and he acquitted himself to his entire satisfaction. After this occasion he did not lose any blood for two or three months and thus the menstrual irregularity, as we may indeed term it, continued over a period of 18 months. During all this time he was liable to the same symptoms, but finally the hæmorrhoidal flux resumed its wonted regularity, and since this time he has been enjoying perfect health.

f. Pregnancy and Lactation.—During these times the menstrual flow is, for the most part, suppressed. The rhythm, however, continues, for by careful examination the suppressed period may be detected. We should therefore expect to find the woman more nervously inclined at these times than at others, and such I believe to be the case, but I have no notes indicating a particular tendency to flush then. Flushes are, however, common during both pregnancy and lactation, when they may be regarded as an expression of the general nervous irritability then prevailing.

Inasmuch as the nervousness of the climacteric begins to manifest itself some years before the commencement of menstrual irregularity, it is not surprising that the later pregnancies are more frequently attended by nervousness than the earlier ones. When a woman becomes pregnant at 40 or thereabouts she is particularly apt to suffer from nervousness during the term, and I have notes of several cases of flushes occurring during the pregnancies of advanced menstrual life.

Sometimes when, at about the age of 40, the nervous symptoms common at the climacteric have appeared in a well-developed form, they may somewhat abate on the woman's becoming pregnant, for it is a well-known fact that pregnancy, far from aggravating a neurosis, may lead to a temporary diminution or actual disappearance of it.

Æt. 40. 7 m. pregnant. Before the pregnancy the patient came to the hospital complaining of distressing flushes of heat and profuse perspirations. Since she became pregnant she has had none.

The injurious influence of lactation on nervous health is probably entirely due to the debility resulting from the drain on the system.

h. Chlorosis.—Vaso-motor disturbances are very common in chlorotics, whether in the shape of flushes, independent shivers, or localized sensations of cold. I have notes of many such cases. It is difficult to say how far these disturbances are connected with the menstrual irregularities which invariably attend chlorosis, and how far they are a more direct manifestation of the chlorotic state.

i. General Debility. — Of the many conditions tending to cause flushes none is more conducive to them than debility, a fact proved alike by the general appearance of the majority of the sufferers, and by the effects of tonic treatment. For although by some drugs, such as nitrite of amyl and the bromides, we may exercise a more or less direct effect upon the flushes, yet we generally produce both a more certain and a more lasting result by a plan of treatment which has for its object the improvement of the general bodily health. Some of the most distressing cases of flushes are observed in nursing women. Among the poorer classes it is not unusual to find a woman nursing her child for two years or more. She then comes to seek relief in a condition of extreme anæmia and prostration, the victim of a long train of nervous symptoms, among which flushes frequently take a prominent place. It is in such cases as these that treatment yields the most favourable results; we may reckon upon a cure in practically all of them by

raising the standard of nutrition to its normal level. Drugs may be helpful in the task, but they are only adjuncts to the treatment, which consists in placing the individual amid a suitable environment, in giving her proper food, rest, fresh air, and so forth.

That, however, the debility which predisposes women to that host of functional nerve disturbances to which they are so liable, does not necessarily go hand in hand with manifest malnutrition is evident from the fact that sometimes the most robust-*looking* women are, when suffering from nervousness, benefited by a tonic plan of treatment. This is particularly noticeable at the climacteric. We may fittingly speak of debility in such cases, for I have seen highly plethoric women more benefited by iron and strychnine than by any other drugs.

Exciting Causes.—As a rule no direct exciting cause can be assigned; the patient tells us that the flushes come on "when quietly sitting at needlework," "when sitting still," or "at night when lying peacefully in bed," sometimes, indeed, waking her up out of sleep; in all of which cases the storm may be regarded as more or less spontaneous. Very frequently, however, it is precipitated by an exciting cause, and we will now consider the chief of these.

a. Emotional States.—Flushes are often excited by emotion; thus the excitement of coming to see the doctor is a common cause. Other emotional states which the patients assign as causes are indicated in the following list:—

Flushes come on when she is startled.
" " when any one speaks suddenly to her.
" " when she "puts herself out."
" " when worried.
" " when waiting at table.
" " when speaking to strangers.

b. Indigestion.—Indigestion is a not uncommon cause. Slight flushes of the face occurring with, or after, meals are familiar to every one. Amongst beverages tea and alcohol are particularly apt to cause them, and hot condiments have the same effect. But though I have notes of a fair number of flushes occurring in combination with dyspepsia, and though this frequently causes simple flushing of the face, lasting perhaps for hours together, I do not consider it a potent cause of the genuine flush; for the most severe dyspepsias may be unaccompanied by flushing. I have sometimes thought that flatulent dyspepsia is more provocative of flushing than other forms, but of this I am not certain.

c. Heat, impure atmosphere.—Confinement to close, ill-ventilated rooms is one of the most powerful exciting causes of flushes, and most people are more liable to flush indoors than out. Everybody is familiar with the stout middle-aged red-faced woman, puffing and panting in a crowd or public assembly. She has been satirized by more than one writer, and is a familiar figure in the pages of Dickens. Such a woman can ill tolerate the heated atmosphere and crush of a crowded assembly. Exposed to these, she readily flushes and feels faint, the faintness which she then experiences being practically always the faintness which occurs in connection

with a flush. Perhaps any one, certainly the majority of people, would feel a glow over the surface of the body and a feeling of faintness if confined long enough in a close, ill-ventilated chamber. The causal connection between a heated, vitiated atmosphere and flushing is shown by the craving for fresh air which most patients manifest during the flush, and by the rapid recovery which ensues when it is obtained.

d. Febrile Disorders.—The minor febrile disorders are frequently accompanied by flushing. Of many of these—designated "colds" in our ignorance of their true nature—the flush is a characteristic symptom. It is particularly so in the case of women, in whom the menstrual process is very apt to be morbidly influenced by any disturbance of the general health. Such disorders further tend to promote flushing by their debilitating effects; and they also apparently sometimes act in a more direct manner, for we know that in febrile states disturbances of the vaso-motor system, in the shape of flushing and shivers, are very common.

e. Organic Diseases.—Phthisis, cancer, heart disease and such disorders are less conducive to flushes than, from their debilitating effects upon the whole system, one would have expected. In the following case, *e.g.*, of organic disease occurring at the time of life when flushes are most common, none were present :—

Æt. 53. Post climac. 3 years. Is suffering from carcinoma uteri. No flushes.

On the other hand, in many cases of organic

disease occurring at the change of life, the climacteric nervous symptoms run their course unaltered. This fact is, I believe, frequently overlooked, and in consequence, symptoms which really belong to climacteric nervousness are ascribed to the organic disease. Thus, I have seen a woman, æt. 40, who, in addition to the symptoms peculiar to locomotor ataxy, experienced a long train of nervous phenomena strictly climacteric in nature and having nothing to do with the organic disease, but which were nevertheless ascribed to it.

CHAPTER IX.

PATHOLOGY OF FLUSHES.

This chapter will be, to some extent, recapitulatory.

It is difficult to determine how far the vaso-motor system is affected in a flush-storm. During the hot stage the superficial vessels of the exposed parts of the body are generally dilated, so that the face and neck, and sometimes the arms and hands, are actually flushed, and being flushed, they are felt to be hot, impulses ascending to the sensorium from the "heat spots." The unexposed parts, on the contrary, if we except the upper part of the chest and back, would appear to be seldom, if ever, flushed at this time, and it is therefore probable that the sensation of heat and tingling felt over them during the hot stage is largely—if not entirely—independent of impulses striking the sensorium from the skin (*i.e.*, from "heat spots"). That a localized sensation of heat may be independent of any vaso-motor dilatation of the superficial vessels of the part to which the sensation is referred is clearly proved by a case already cited in which the hands, while feeling hot during the hot stage of the flush, went deadly pale.

While the area of vaso-motor dilatation of the cutaneous vessels during the hot stage is thus limited in extent, the area of vaso-motor contraction of the same vessels during the cold stage is much more widespread. In most cases, beyond all doubt, the vessels of the entire region over which the chill is felt are contracted, and this is sometimes the whole body-surface. Thus the face is often observed to turn white at this stage, and not infrequently the whole of the skin becomes "goosey." Nevertheless the sensation of cold in any part may, like that of heat, be quite independent of the vaso-motor condition of the cutaneous blood-vessels of that part—a point also brought out by a case previously cited in which there was a sensation of icy coldness over a large area of skin, although this area felt hot to the touch, thus suggesting vaso-motor dilatation of its vessels. In such cases we must assume that the nervous changes in the highest centres which constitute the physical side of this sensation are independent of any specific impulses ascending from the skin (*i.e.*, from the "cold spots").

When first investigating the flush-storm, the possibility of all its various symptoms being due to disordered vaso-motor action naturally suggested itself to me, for the mind of the observer is perforce attracted by what is to him the most obtrusive phenomenon of the attack—in this case the vaso-motor change of the cutaneous blood-vessels. The attention being thus centred upon the vaso-motor system, this question among others presented itself:—Are the faintness and sense of suffocation due to anæmia of certain central parts of the nervous

system? These symptoms are very apt to attend the hot stage, during which certain of the cutaneous blood-vessels are dilated, and the determination of blood to the surface might well—it seemed—by abstracting it from internal parts, lead to both these sensations; certainly, in an ordinary faint the sensation of suffocation as well as the feeling of faintness is due to insufficient blood-supply to certain regions—in fact, a deficient supply of oxygen, no matter how brought about, is likely to cause it.[1]

When, however, further investigation showed that only a small area of superficial blood-vessels was affected during the hot stage, doubt was cast upon this explanation, and on the discovery that both these feelings may be experienced during the cold stage, when there is a widespread constriction of the superficial blood-vessels, it had to be abandoned. As my investigation proceeded, it became increasingly evident that there is no necessary parallelism between the vaso-motor condition of the skin and the other phenomena of the storm (a fact already sufficiently insisted upon), and that it is therefore quite impossible to connect the two.

It is, however, still open for any one to assume (as I at first surmised) that all the phenomena of the storm—internal as well as external—are due to disordered vaso-motor action—that the storm is, in fact, essentialiy a vaso-motor storm, and it would

[1] The possibility of all the phenomena of the hot stage being referable to vaso-motor dilatation was further suggested by the effects upon the body of the administration of nitrite of amyl. This drug produces dilatation of the arterioles throughout the body, with faintness and a tingling of the ears and cheeks, and the patient complains of feeling hot. See Charles Aldridge, "West Riding Asylum Reports," 1871–2, p. 98.

be difficult to absolutely disprove such an assumption, for we are in complete ignorance of the vaso-motor condition of internal parts at any given time, since the state of the superficial blood-vessels, as will be more particularly insisted upon later, is no index to that of the deep ones. The question thus not admitting of experimental proof must be decided in other ways.

For a long while it was thought that all the phenomena of the epileptic fit were due to vaso-motor disturbance. This view has, however, been practically discarded by the most competent authorities, so overwhelming is the evidence against it, and in like manner it seems to me now, in the light of the facts I have observed, wholly impossible to explain all the phenomena of the flush-storm on this hypothesis. Take the sweating, for instance. We have seen good reason to conclude that this is due to the excitation of special trophic centres, and may be quite independent of vaso-motor change. The whole spirit of modern physiology favours the view that the vaso-motor and trophic centres are separate and distinct, though it might of course be argued that the trophic centres may be specifically influenced by modification of the tension of the plasma environing their ganglion-cells and thus indirectly through the vaso-motor system. We may be quite sure, however, that it is seldom thus that nerve ganglia are excited into specific action, such action being rather *due to nervous impulses striking them through their processes.* No doubt certain crude effects may be caused by modification of plasmic tension,—*e.g.*, dimness of vision, giddiness, confusion, and the con-

vulsions of intense anæmia,—but it may safely be asserted that highly elaborated mental effects, such as complex emotions or intellectual states can not.

Wherefore we are driven to conclude that the vaso-motor phenomena of an ordinary flush-storm constitute only a part of the storm, other phenomena of it being absolutely independent of vaso-motor action. We have now to ask, What is the primary seat of the discharge?

It is evident that the highest centres are involved in the storm, seeing that it may manifest itself not only by sensations, but by emotional and intellectual states. Now, does the discharge originate in these centres or in lower ones, the highest centres being only secondarily implicated? It is now more or less generally acknowledged that in the genuine epileptic fit the discharge usually begins in the last-named. That it may begin in the cortex is distinctly proved by that class of cases (Jacksonian epilepsy) in which the patient is cured by cutting out the "discharging lesion," and that it frequently originates in the highest centres is, as Hughlings Jackson insists, placed beyond all doubt by the fact that the aura may consist of a complex intellectual state. Jackson's brilliant conception that all parts of the body are represented in the highest centres explains how the whole body may be affected by a discharge originating in them.

If, then, the discharge in epilepsy begins in the highest centres, may not the flush-storm start in the same level? In blushing the explosion without doubt begins there, and when we come to study blushes we shall see how impossible it is to draw

any sharp dividing line between them and flushes, so that we may fairly look for flushes originating there too. Many flushes, those, for instance, beginning in the chest and back, show—as we have seen—a marked analogy to certain epileptic auræ, and may therefore obviously have the same starting-point. In a flush the sensation is generally one of heat, but not always; occasionally some other sensation will ascend the chest and be followed by the cutaneous phenomena peculiar to the flush, and again, sometimes these ascending sensations are unattended by any distinct cutaneous phenomena. What are we then to call them? Do they belong to the hysterical and epileptic order, or do they belong to that large class of nerve-storms of which it is the purpose of this monograph to treat? I would here draw attention to the exceeding commonness of these unnamed storms, and to the desirability of carefully studying them; they are very frequent indeed among women, and are abundantly met with in every medical out-patient department.

That they are very closely related to ordinary flushes I am convinced: many of them may, in fact, be regarded as flush-storms shorn of their cutaneous phenomena. Then, again, both they and genuine flushes are closely related to the aura of the hysterical seizure, and it seems doubtful whether any sharp distinction can be drawn between this and the epileptic aura. The same aura may be followed by an epileptic or by a hysterical fit, or by a combination of both—the hysteroid phenomena following upon the epileptic. In most of these cases we must assume that the discharge begins in the same

parts, and that the subsequent development of the epileptic or hysterical fit, or of both, depends upon the peculiar condition of the nervous system at the time.

For me, then, a so-called flush belongs to a very comprehensive class of nerve-storm, closely allied to, and, in fact, sometimes indistinguishable from, an epileptic or a hysterical aura, and starting like them in a nervous level situated high up—possibly even in the highest level; the parts ("nervous arrangements") involved being more particularly those which represent the organic viscera—above all, the thoracic viscera. The representatives of these parts in the highest centres constitute the chief physical basis of the emotions; and in woman—in whom the emotional element is most fully developed—they are peculiarly unstable and liable to explode.

P.S.—The epigastric aura is highly interesting. It is common in simple emotional manifestations, amongst others attending blushing, as we shall see. It frequently occurs as an independent minor nerve-storm, and is a common aura in epileptic and hysteroid convulsions, as well as in flushing. Since this book has been in the press I have read with much interest W. Bevan Lewis's masterly work on mental diseases, and I find it there stated that this same aura often precedes the insane homicidal impulse. Thus, one patient was suddenly seized with an intense burning heat in the epigastrium, and this "was rapidly transferred to the throat, accompanied by a sense of constriction and urgent thirst, upon which the homicidal fury arose." [1]

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[1] "A Text-Book of Mental Diseases, with special reference to the Pathological Aspects of Insanity," by W. Bevan Lewis, London, 1889, p. 180.

CHAPTER X.

Bibliographical.—Not a day passes in my out-patient room that I do not see several cases of flushing. It is therefore evidently a very common disorder, and it is not a little surprising that it has hitherto remained completely unstudied, receiving, in fact, mere casual notices only, and this in spite of its causing great distress to the patient and possessing much interest from the pathological point of view. After the most careful search I have been unable to discover a single paper dealing with it as an independent neurosis. Flushing (= a rush of blood to the skin) and sweating are frequently mentioned in medical writings as isolated symptoms; in only a few instances has there been any attempt at precise description, and even in these it is evident, from the loose and casual method of the author, that he is either stating the opinions of others, or trusting entirely to a chance recollection of cases which he has observed—a very dangerous proceeding, I need hardly remark. This is the plan pursued by most of the older, and not a few modern medical writers, and it has resulted in the burdening of our literature with much matter not only useless

but positively harmful. The only safe, the only warrantable, way of studying a disease is to take a series of full and accurate notes on its manifestations, and to base one's conclusions on a careful analysis of these. I say a careful analysis: any one who has attempted such a task must have discovered how much self-restraint is required in order to be perfectly accurate, and how difficult it is to obtain strictly reliable results. It is very seldom that these can be expressed with mathematical accuracy, for not only have we to grapple with the difficulties of looseness of language, want of observation and, it may be, general ignorance in the patients on whom we depend for our data, but there constantly arise opportunities for false conclusions and for tempting but inexact generalizations. For these reasons I have only in a few instances quoted figures. Many of the statistical enquiries it has been my ill-fortune to have to wade through have carried self-contradiction upon their very face. It is only fair, on the other hand, to say that some few are models of precision and logic.

In the following short survey of the literature of flushing I have, I believe, brought out all that is essential or of value in what has been written on the subject. It would obviously be impossible—and certainly unprofitable—to give an exhaustive list of all the authors who have merely alluded to flushes in passing, but I do not think any important ones are omitted.

Laurence Heister, M.D., 1712.—I am indebted to Dr. Clift, of St. Luke's Infirmary, for pointing out to me the following case:—

"*On a flying heat in a lady, which was very troublesome to her.*—In July, 1712, the dowager lady Rieden, at Kornburg, about 40 years of age, sent for me and complained that she was frequently troubled with a great commotion in her blood, which came on her of a sudden, attended with a great heat and redness in the face, seeming first to proceed from the stomach, and rising immediately up to the head, frequently exciting a sweat, and always attended with great anxiety and oppression about the præcordia; these symptoms returning at various distances, sometimes sooner and sometimes later, and ceasing as variously; she was also frequently troubled with flatuses and costiveness, and the menstruations were irregular."

The doctor ordered bleeding and certain medicines. He also "advised her to drink at meals either wine, or water, or small beer, and frequently of a night; half an hour before going to rest, to drink a wineglass of fair water, to cool the heat and motion of the blood, and also desired her to avoid hot things. After these medicines she found herself quite recovered."[1]

In this case the author brings out the following important facts:—That the flush started from the præcordia (*i.e.*, on the left side) and ascended; that it was attended by præcordial anxiety, that there were redness, heat, and sweating, that it occurred at the age of 40, that menstruation was irregular, that the patient was suffering from flatulence, and that the attacks were more or less frequent. From the accuracy with which this case is described I have little doubt that Heister copied it from his note-book. It is far more accurate than a description written by one of his countrymen nearly 200 years later.

John Fothergill, 1781.—Writing of the climacteric, Fothergill describes flushes in the following language—his remarks applying particularly to plethoric women:—

"They are, for the most part, attacked about the time of menstruation with sudden flushing heats, succeeded by instantaneous sweatings, continuing for a few seconds, then going off for a short time, and occurring many times in the day; they are worst after eating, in a room much heated, in large assemblies, in bed, attended with restlessness and frightful dreams. These gradually abate for a few weeks, and, as the period approaches again, come

[1] "Medical, Chirurgical and Anatomical Cases and Observations." By Laurence Heister, M.D., etc. Translated from the German by George Wirgman, A.D. 1755, p. 151, Observation cxxi.

on, and so successively for a year or more, terminating sometimes in large immoderate fluxes; sometimes in apoplexies, palsies, and other diseases arising from plenitude."[1]

Unlike Heister, Fothergill in the above description trusted, I little doubt, to his memory and his general impressions.

During the next 20 or 30 years Fothergill was constantly quoted by French writers. I now proceed to quote from them, although there is little or nothing original in their writings, some of them indeed copying from one another in a most barefaced and amusing manner. The chief interest now attaching to these authors is that they probably reflect more or less accurately the knowledge of their time.

J. Chouffe, 1802, alludes to the flying heats (bouffées de chaleur) occurring at the climacteric. He says they may cause a feeling of suffocation.[2]

Béchard, 1802, cites the case of a woman who suffered every month from colic and "des movements fébriles qui se terminaient par des sueurs abondantes."[3] These latter were, I take it, ordinary flushes of heat, these being, I believe, frequently mistaken by the earlier physicians for examples of genuine fever.

H. Lamaze, 1805, alludes to the fact that the flushes are frequently accompanied by a feeling of suffocation.[4]

J. N. Lestrade, 1815, also alludes to the feeling of suffocation which may attend flushing; also to the sweats.[5]

Primerose, writing on the climacteric, very briefly alludes to flushes. "*Pariter* instare menstruorum naturalem defectum in senioribus (feminis) indicant dolores et gravitates lumborum, cruram, femorum; *rubores quidam in facie subito maxime post pastum contingentes qui deinde facile in sudores evanescunt*, capitis dolores, vertigines, tinnitus aurium, semicraniæ, appetitûs

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[1] "A Complete Collection of the Works of John Fothergill, M.D., F.R.S." London, 1781, p. 444, *et seq.*

[2] "Des Accidens et des Maladies qui surviennent à la Cessation de la Menstruation." Par J. Chouffe. Paris, 1802.

[3] "Essai sur les Maladies auxquelles les Femmes sont le plus Fréquemment exposées à l'Epoque de la Cessation des Menstrues." Par M. Béchard. Paris, 1802.

[4] "Essai sur la Cessation du Flux menstruel," etc. Par H. Lamaze. Paris, 1805.

[5] "Considérations générales sur l'Epoque critique des Femmes." Par J. N. Lestrade. Paris, 1815.

diminutiones; sic sensim minuitur fluxus ille, interdum per aliquot menses intermittit, deinde redit, postmodum omnius cessat."[1] (I regret that I have been unable to secure the original in order to verify the quotation.)

Romberg, 1853, regards *ardor* and *algor* as cutaneous hyperæsthesiæ. A common variety of the former is *ardor volaticus s. fugure;* according to this writer, the face, forehead and chest are involved; there is occasionally a thin perspiration. The heat lasts a few seconds; it is generally met with at the climacteric, and is associated with mental excitement and great restlessness. He also alludes to the localized feeling of cold (algor circumscriptus). This, he says, generally occurs on the scalp, and occasionally on the skin of the abdomen.[2]

P. Dumont, 1833, brings out the fact that the flushes may attack the face and the *hands*.[3]

Brierre de Boismont, 1842, is frequently quoted on the subject of menstruation which he studied clinically. He makes very little mention of the subject of flushes, contenting himself with saying that at the time of menstruation the patients may suffer from "des feux, des chaleurs, qui leur montent au visage." In another part he observes that a fair number of women are subject at the menstrual period, "à des frissons, à un véritable mouvement fébrile." Many previous authors allude to this tendency to shivering.[4]

E. Krieger, 1869, is apparently the first author who attempts any detailed description of flushes. According to him heats begin for the most part in the region of the heart and in the upper part of the body and head. There is regularly a reddening of the skin and an increase of perspiration (?). A feeling of sudden weakness or faintness, and shivering occur, he states, rarely, and then precede the heat. The patients feel hot all over, throw open the windows and clothe themselves lightly, but there is no rise of temperature. The heats last a few minutes and recur four or five times every hour, both by day and night; they are very common during

[1] Primerose, "De Mulierum morbis et symptomatis," lib. i. Rot. 1605. Quoted by P. N. Glinel in his Essay on the Climacteric. Paris, 1818.

[2] "A Manual of Diseases of the Nervous System." By M. H. Romberg. Vol. i. p. 89. (New Sydenham Society.)

[3] "Dissertation sur la Disparition des Règles." Par P. L. C. Dumont. Paris, 1833.

[4] "De la Menstruation," etc. Par A. Brierre de Boismont. Paris, 1842.

the climacteric years, but not uncommon during pregnancy and in connection with menstruation, especially when it is irregular.

He, following Romberg, attributes the condition to a hyperæsthesia of the cutaneous nerves (!), and classes it among the spinal neuroses, and he thinks that this hyperæsthesia is incomplete, because sensations of touch and painful impressions are not heightened. He discusses shivers and the feeling of cold, which occur without depression of temperature. Many women, he writes, have regularly a slight shivering at the beginning of menstruation, and cold damp hands; others complain of ice-cold feet and a feeling of deadness up to the middle of the calves, and that they cannot be made warm. The chlorotic sometimes complain of cold extremities. Hysterical patients often suffer from a feeling of cold in a limited area, especially in the head.[1]

J. E. Tilt, 1882, in his work on the "Disorders of the Climacteric," gives a brief description of flushes. In one part (p. 280), he says that "in some women the flushes are preceded by chilly sensations;" on another page (p. 58), that "they may follow or precede a chill, or a momentary sensation of shivering, or sinking and faintness at the pit of the stomach, but *they occur as a rule without these sensations.*" (The italics are mine.) He recognizes the fact that the flushes may begin in the epigastric region. He also notes that they may begin after cessation, even in extreme old age. The face and chest generally suffer most, "and the hands and the nails may feel like fire," but the whole of the skin may be affected. No mention is made of the condition of the cutaneous vessels under these circumstances. The pulse is often weak and slow. "Many feel so faint under their influence that they must have air, or they would swoon." The causes, according to Tilt, are: Emotion, nervous shock, external heat, over-clothing, hot rooms, hot drinks, over-feeding, the checking of diarrhœa or leucorrhœa. He alludes to local sweatings and burnings, and to the fact that the patient may feel cold while the flushes are on. Some women habitually remain chilly "notwithstanding the flushing of the face."[2]

Ed. Long Fox, 1885, in an exhaustive work on "The Influence of the Sympathetic on Disease," only very briefly alludes to flushes

[1] "Die Menstruation. Eine Gynäkologische Studie." Von E. Krieger. Berlin, 1869.

[2] "The Change of Life." By Ed. John Tilt, M.D. London, 1882.

of heat, in the following passage:—"Flushes of heat and sweating are not uncommon with women at the menopause."[1]

E. Börner, 1886, speaks of the "flying heats" which occur, according to him, in practically every woman at the climacteric. He insists that these and other nervous symptoms of the climacteric bear no necessary relation to irregular menstruation, since they may occur, for instance, when menstruation is quite regular, and may not be aggravated by sudden cessation. He regards the climacteric heats and perspirations as expressions of the irritable condition of the nervous system prevailing at this time. The latter he compares with the sweatings which are so common among "leicht reizbaren und nervösen Individuen." The situation of the sweating differs—he points out—in different individuals, but in the same individual generally occupies the same position. It may be universal; when limited, the most common situations are the chest, the nape of the neck, the scalp, the forehead. The climacteric perspirations generally begin spontaneously, or on the slightest movement, or emotional excitement; sometimes they are worse in bed. They are often *followed* (but whether the author is here alluding to independent sweats, or to those occurring in conjunction with heats, he does not make clear) by great lassitude and fatigue, especially when widely distributed. Later on he observes that the flushing and sweating generally occur together, and not infrequently invade the same parts of the body. He has seen the flushes occur as late as the age of 67.[2]

I have been unable to find indications of a more thorough study of flushes among any other modern works. The following I cite as an instance of the treatment the subject generally receives:—

B. W. Jaggard, 1886.—"The perspirations due to the change of life may have prodromal symptoms. These symptoms are—sensations of cold, shiverings, chills, sinking or faintness referred to the pit of the stomach. Usually, however, they are not attended by any premonitory symptoms. They are frequently accompanied by dilatation of the skin vessels" (= Flushes?).[3]

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[1] "The Influence of the Sympathetic on Disease." London, 1885, p. 328.

[2] "Die Wechseljahre der Frau." Von Ernst Börner. Stuttgart, 1886.

[3] "A System of Practical Medicine." By W. Pepper, M.D. Lond. 1886, p. 436, vol. iv.

PART III.

BLUSHING.

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CHAPTER I.

Justification of the term "Pathological Blushing."—It is necessary at the outset to justify the somewhat clumsy term, "pathological blushing." It may be thought that the phenomena of simple blushing can have little or no interest for the physician, but that this is an erroneous idea, founded on an imperfect conception of all that blushing may entail, a very brief reflection will suffice to show. If it hampers the individual in his commerce with the world, if it causes him to shun society, to seek solitude, to lead the life of a recluse—and it may do all this—then it is essentially pathological in the true sense of that word. At the best it is no very agreeable experience, and every one (except perhaps the accomplished coquette) would, I suppose, suppress a blush were it possible to do so. It is not, however, by any means generally realized how much misery an inordinate tendency to blush may cause. Even the strongest-minded individual is placed at a considerable disadvantage if he becomes at any time

liable to colour on the slightest provocation; while with the nervous and self-conscious—and intense blushers are usually both—such a predisposition is not only embarrassing but distressing and harassing in the extreme, handicapping the unfortunate subject at every turn. For the blush is the external sign of an inward working of the mind; it betrays that which one would be at great pains to conceal; the strongest effort at self-control is powerless to hide this glaring testimony to the inner thought. The blusher involuntarily reveals himself to others, and the knowledge that his discomfiture is patent to all makes his confusion worse confounded. To those whose avocation brings them much into contact with their fellow-men the fate of the inveterate blusher is peculiarly hard. He lives in constant dread of making an exhibition of himself; often enough he is unable to carry on his business, and though he tries a new one, it is only to be compelled to abandon it also for the like reason. Thus he may go from place to place, seeking comfort and finding none; he is, as I once heard a patient put it, "crippled in every direction." Who, then, will doubt the existence of true pathological blushing?

Duboux[1] observes that the continual dread of blushing renders the inordinate blusher "absurdly timid and shy: he avoids every occasion of coming forward; he seeks solitude; social and sometimes professional duties become horribly painful to him; his life is literally ruined by a trifle—(brisée par une niaiserie)."

[1] "Bulletin de la Société Médicale de la Suisse Romande," 1874, p. 316.

The following cases show the hampering effect of excessive blushing:—

Æt. 25 (man). Tea-taster. Robust health; total abstainer from birth; his only ailment, uncontrollable blushing which "causes him discomfiture at every turn;" he lives in constant dread of appearing absurd.

Æt. 27 (man). Was a soldier, but compelled by excessive and constant blushing to abandon his profession.

Æt. 33 (man). Unmarried. Formerly in the navy; physically strong and courageous. Has just had to give up the post of prison-warder through inordinate blushing, which, he says, has lost him many good chances in life.

Æt. 28 (man). Has recently had to give up the study of medicine through excessive blushing.

Æt. 19 (man). Chemist's apprentice. Blushes frightfully when standing behind the counter serving customers; will have to seek some other occupation if not relieved.

Æt. 32 (man). Minister. Is so afflicted by blushing that he has latterly entirely given up duty.

Æt. 27 (woman). Nervous; considers blushing her chief trouble. It has, she says, quite spoilt her life.

Æt. 27 (man). Musician. Has been offered an appointment as bass singer in a cathedral choir, but is afraid to accept it on account of his blushing.

Æt. 30 (man). Draper. At times, owing to blushing, it becomes a fearful ordeal to transact the most ordinary matter of business with strangers, or even with acquaintances.

Distinction between Flushing and Blushing.—The more closely one studies the phenomena of blushing, the more impossible does it seem to distinguish it from flushing. The only safe criterion of difference lies in the exciting cause: A blush *always* arises from emotion, a flush only occasionally. And whereas the mental states which induce blushing consist, as Darwin observes, "of shyness, shame, and modesty" alone, the essential element in all being self-attention, a flush may arise

from any emotion causing sudden nervous agitation.[1] When an individual, then, becomes red in the face from any of these three causes he may be said to blush. They all imply "a sensitive regard to the opinion, more particularly for the depreciation of others, primarily in relation to our personal appearance, especially of our faces; and secondarily, through the force of association and habit, in relation to the opinion of others on our conduct."[2] Of the three, shyness is by far the most common cause. A person, to quote Darwin again, will blush a hundred or even a thousand times from this cause to once that he blushes from shame—that is to say, from a sense of blame. Many of the writers who have touched upon the subject of blushing appear to regard shame as the chief exciting cause, but I think this is probably because they have not clearly distinguished between shame and shyness. Pathologically, however, it is very necessary to keep the distinction between the two in mind, for blushing from shame is normal and legitimate, while blushing from shyness, except in the young and inexperienced, can scarcely be regarded as so, certainly not in its exaggerated forms. Darwin points out that the word *shyness* in many languages is etymologically related to the word *fear*, thus showing that the opinion is widely, even if unconsciously, held that shyness and fear are closely related. In like manner I find that writers have been struck with the likeness between shame and fear. The analogy between the *effects* of the two did

[1] "The Expression of the Emotions in Man and Animals.' By Charles Darwin, M.A., F.R.S., etc., p. 326.

[2] *Ibid.*, p. 337.

not escape the keen observation of Aristotle;[1] and Oken[2] maintains that shame is only a degree of fear.

The close connection between shame and blushing is brought out in an interesting way by the fact that in Swedish the one word (blygsel) indicates both; similarly, in German, "schamgefühl" may be used to denote either the sense of shame or the blushing which it provokes. The shame which causes blushing may, according to Darwin, result from two causes, viz., from actual crime, or from a breach of etiquette. It should further be mentioned here that modesty embraces two essentially distinct mental conditions, namely, humility and the emotion provoked by any indelicacy. In popular language modesty is also often used as synonymous with shyness, but this use of it, following Darwin, I have avoided.

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[1] Problem, sect. xi. 53; *Καίτοι καὶ ἡ αἰδὼς φόβος τίς ἐστιν; Ἡ διαφέρει πολὺ τὸ πάθος; οἱ μὲν γὰρ αἰδούμενοι ἐρυθριῶσιν (ἡ δὲ ἀγωνία αἰσχύνη τίς ἐστιν), οἱ δὲ φοβούμενοι ὠχριῶσιν.*

[2] "Naturgeschichte," iv. S. 205. "Die Scham ist nur eine partielle Furcht."

CHAPTER II.

Causes of Blushing—*continued*.—Having seen that the essential difference between flushing and blushing lies in the exciting cause, we may now at once proceed to consider the causes of blushing.

Inasmuch as self-consciousness is the essential mental condition underlying blushing, I propose to subject it to a somewhat careful analysis, and before doing so it is advisable to make some observations on the division of consciousness into subjective and objective, because, as we shall see, the recognition of this division has an important practical bearing upon treatment.

Consciousness, Subjective and Objective.—The term consciousness needs no definition. All mental states are included under it: every sensation, emotion, intellectual operation, every act of willing is, so far as it obtrudes itself upon the ego, an act of consciousness.

Consciousness is frequently described as of two kinds—subjective and objective. Purely subjective consciousness is, I take it, consciousness into which ideas of an external world do not enter. When the

mind is wholly occupied with some feeling or feelings detached from all material associations it is said to be in a purely subjective state; thus when a diffused sensation of heat is felt and not distinctly referred to any part or parts of the body, and not associated with any external object, the consciousness is said to be essentially subjective; but directly the sensation is distinctly localized, above all, directly it is connected by the mind with some "thing" external to the body, the consciousness is said to be objective. The distinction between these two forms of consciousness is, however, more or less artificial; *i.e.*, there is no essential difference between the consciousness of an external object (perception) and subjective consciousness as above defined. Only those who do not realize the fact that we can know nothing whatever of anything outside of, or apart from, mind could doubt for one moment the truth of this statement. We can think of a material world in terms of consciousness only, and our consciousness of an external world is radically of exactly the same nature as subjective consciousness, using the term in the above sense.

Subjective consciousness, as thus defined, takes no account of complex thought processes, but refers simply to *feelings* which are detached from all material associations. But the term subjective, as opposed to objective, consciousness is in ordinary language used in a wider sense.[1] When an individual is so completely wrapped up in his own *thoughts*, to use the popular expression, that the external

[1] Unfortunately the two terms are very loosely used by writers.

world is dead to him, he is said to be in a subjective state, but directly he becomes conscious of an external world, directly the sensations resulting from the operation of various external forces upon his end-organs distinctly obtrude themselves upon his consciousness, and are referred to the external world (or *perceived*), he is, so far as they are concerned, in an objective state; and directly they engross his entire attention, so that his thoughts go out actively to them, his mental attitude is said to be essentially objective.

As a matter of fact, however, the individual who is wrapped up in his own thoughts—who is, in quasi-popular language, in a subjective attitude of mind—is also to a large extent objective. Subjectiveness of thought is, in fact, always largely tinged with an objective element. This must be the case whatever train of thought the mind is pursuing, since all our ideas are necessarily in the first instance objective: they originally came through the senses, and they cannot be completely dissociated from impressions derived from without, even in the most abstract processes of thought.

Thus when an individual sees a brick he is in an objective state of mind. But so also is he, as Hughlings Jackson observes,[1] when he *thinks* of one. The difference is not one of kind, but of degree; when he thinks of a brick the nervous system is agitated in the same way as when he actually saw it, though in a fainter degree. And thus supposing the individual above referred to, to be wrapped in

[1] See "Remarks on Evolution and Dissolution of the Nervous System." By J. Hughlings Jackson. London, 1888, p. 1.

thought on some of the affairs of everyday life—his horses, his dogs, his business, his home—his mind will be in practically the same condition as if he were actually experiencing that which he is recalling or imagining; that is to say, his mentation is essentially objective, for his thoughts go out to the object world. Similarly, an individual reading a realistic narrative may almost be said to witness—more especially if he have a vivid imagination—the scenes and events which are depicted. It would obviously be a purely artificial distinction to speak of the mind as subjective in the one case, and objective in the other.

When, however, the train of thought pursued is abstract, as when a mathematical problem is thought out, the objective element in it is less evident, it is so disguised as to be almost ignored. Nevertheless, the numbers and symbols employed in such thought, are essentially derived from the objective world. We may therefore speak of different degrees of objectivization in mentation. During mathematical calculations the objective element is slight; in reading a vivid narrative, or in vividly recalling an actual experience, it is much stronger; in actual perception it is strongest.

Self-consciousness.—Self-consciousness is sometimes used in the sense in which Hughlings Jackson employs the term subject-consciousness, that is to say, to denote the "awareness of our existence as individuals." This, as I understand it, is practically the same as consciousness of the ego; *i.e.*, the various mental states occurring in connection with one

organism are felt as belonging to one individual; they are unified under one personality, and this sense of individuality—this "ichheit"—which is ever present, no matter what change consciousness undergoes in objectivization, is subject-consciousness.

"Subject-consciousness is the comparatively unchanging, the most unchanging. It is thus a contrast to object-consciousness, which is the continually changing" (Hughlings Jackson, *ibid.* p. 7).

Subject-consciousness in this latter sense is sometimes spoken of as *self-consciousness*. I shall, however, use the latter term in a wider sense—to connote, namely, not only the consciousness of a mental individuality or ego, and of such an individuality joined to a material body, but *self-attention* also, whether as regards body or mind; that is to say, to include the *critical contemplation* by an individual of his body, and of his mental self—of his past life, his moral responsibility, his future destiny (=introspection). Such self-consciousness (self-attention, it might more properly be called), though resting upon subject-consciousness,[1] which, indeed, is at the bottom of all knowledge, is yet something more. In self-consciousness the individual scrutinizes his own mental and physical being in much the same way as he would examine and criticize the physical and mental attributes of another individual, and forms a good, bad, or indifferent opinion of his own moral, intellectual, or physical being from the standpoint almost of an outsider. The difference between subject-consciousness (or the mere sense of a distinct personality) and self-consciousness (or self-attention)

[1] In the sense in which Jackson uses this term.

will perhaps be made clearer by the following considerations.

Up to the age of two or three there is little or no self-consciousness, but there is, of course, subject-consciousness, or awareness of individual existence. The child does not at this early age bend the mind in upon itself, and contemplate its past, present, or future; neither does it direct distinct attention to its body and form an opinion upon that. Nevertheless it has a distinct mental ego. The same is true of the dog and other animals high in the scale, which, although of course possessing conscious individuality, are endowed in only a slight degree with self-consciousness. It is thought by some that self-consciousness begins in the child when it ceases to speak of itself in the third person, and substitutes the pronoun of the first person for its proper name. The acquisition of language by the child is on the same lines as its evolution in the human race, and it is possible that the first appearance of the personal pronoun in the evolution of language—whether in the race or in the individual—marks the first appearance of a *well-defined* self-consciousness. It is certainly an interesting fact that in the growth of language pronouns were of somewhat late origin. I am convinced, however, that distinct self-consciousness exists in the child before it speaks of itself in the first person. The young child uses no pronouns at all, but will call its parents and its nurse by their names simply because it constantly hears these used and gets into the habit of associating them with the persons, as also its own name with itself—an amply sufficient reason for its always speaking of itself in the third

person. With advancing years, however, the child becomes distinctly self-conscious, and undoubtedly—as Sully observes[1]—the first germ of self-consciousness is concerned with the material body. The full self-consciousness of a mental individuality comes later. Self-consciousness directed to the body is therefore of a much cruder nature than that which is directed to the mental self, and it may be very strongly developed in the weak-minded. Whatever self-consciousness the lower animals possess is chiefly of this nature. Thus a swan or a peacock is certainly to some extent physically self-conscious. "It is," writes Anstie, "with the age of puberty that self-consciousness begins to be a feature in the mind of the young, and its appearance marks the entrance of a dangerous element into the character. The mental antidote to its possible evil effects is to be found in a vigorous (but not excessive) training of the mind in studies which shall be as far as possible external, and the discouragement of all tendencies to introspection."[2]

We may conveniently classify self-consciousness as follows:—

1. Self-consciousness directed to the body { *a.* To external appearance. *b.* To bodily functions.
2. Self-consciousness directed to the mental being = introspection.

1. **Self-consciousness Directed to the Body.**—*a. To external appearance.*—An individual who possesses in excess this kind of self-consciousness is apt

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[1] "The Teachers' Handbook of Psychology," p. 256. By James Sully. London, 1888.

[2] "Neuralgia and the Diseases that Resemble it," p. 214. F. E. Anstie. London, 1871.

to think too much of his personal appearance, and when such is the case he always fancies that others are equally interested in it. When in a public thoroughfare or assembly, he imagines himself the observed of all; and what he thinks of himself, such he believes others are thinking of him. If he is pleased with himself, he will fancy that others are gazing upon him admiringly; if he holds an unfavourable opinion of himself, he will imagine that they regard him in a disparaging or, it may even be, in a ridiculous light. In either case self-consciousness, being excessive, is abnormal—in the former, ethically abnormal, and of little interest to the physician as physician; in the latter, pathologically abnormal, and therefore of importance to him. The individual who is vain of his personal appearance may enjoy sound nervous health, but he that is for ever imagining that others are looking at him and seeing something to disapprove, is probably always of nervous temperament. All physicians are familiar with this latter type.

Darwin believes that "attention directed to *personal appearance*, and not to moral conduct, has been the fundamental element in the acquirement of the habit of blushing."[1] "It is notorious that nothing makes a shy person blush so much as any remark, however slight, on his personal appearance. One cannot notice even the dress of a woman much given to blushing without causing her face to crimson. It is sufficient to stare hard at some persons to make them, as Coleridge remarks, blush, 'account for that

[1] See *Ibid.*, p. 327, *et seq.*

he who can.'" He then points out that women, as a rule, are much more sensitive about their personal appearance than men, and the young than the old, and that, in consequence, these two classes are most given to blushing. Young children who are not self-conscious do not blush; and "it is one of their chief charms that they think nothing of what others think of them. At this early age they will stare at a stranger with a fixed gaze and unblinking eyes, as at an inanimate object, in a manner which we elders cannot imitate." Further, the young of either sex are very sensitive to the opinion of the opposite sex as regards their personal appearance, and they therefore blush much more readily before those of the opposite than of their own sex; indeed, in Darwin's view it is because the face is the chief object of self-attention that its vessels are more liable to dilate under certain emotional influences than those of other parts. "The face," he remarks, "is the chief seat of beauty and ugliness, and throughout the world is the most ornamented," and he explains blushing in the following way:—Attention directed to any part of the body is capable, beyond all doubt, of producing distinct changes in that part, the most frequent being vaso-motor dilatation; (and not only this, but a case has been recently described in which actual vesication was thus set up; indeed the most surprising effects may be induced in this way). The face, as the "chief seat of beauty or ugliness," has had an extra amount of self-attention bestowed upon it through successive generations; in consequence, its vessels have become highly prone to dilate, and thus when self-attention is

directed to it, as when we fancy others are scrutinizing us, blushing ensues. The fact that in Europeans the blush does not affect covered parts of the body, while in races who habitually go unclothed, or partially unclothed, it is much more widely spread, is in favour of this view, for among the latter self-attention is not strictly confined to the face. The following case also supports Darwin's view in a most singular way :—

Æt. 29 (man). Is very liable to blush at dinner; if talking to a person at his side will *blush on this side only!*

No doubt Burgess and Hagen are right in attributing the vaso-motor susceptibility of the face in some measure to the fact of its constant exposure to variations in temperature; but this susceptibility is not of itself sufficient to explain the all but constant limitation of the blush to the face and adjoining parts, for, as Darwin observes, the hands which are equally exposed to alterations of temperature are but seldom implicated in true blushing.[1]

b. To bodily functions.—The individual who is continually contemplating his own body is also apt to pay undue attention to its various functions, and to be perpetually asking himself whether they are going on normally or not. He examines his tongue and his secretions, and by giving undue attention to the various aches and pains which may almost be said to be inseparable even from health, he increases them tenfold. This concentration of the attention upon various parts of the body produces a change in their functions, and he may in this way bring on

[1] See *Ibid.*, p. 329.

actual disease. This form of self-consciousness belongs to the hypochondriac, and it is practically always associated with an undue tendency to introspection. How far such individuals are self-conscious as regards personal appearance I am unable to say, but I am on the whole inclined to think that they are generally abnormally self-conscious in this respect also.

2. **Self-consciousness Directed to the Mental Self=Introspection.**—As the child waxes older he becomes more definitely conscious of possessing a mental individuality. He begins to contemplate himself as a thinking, willing, and feeling being; he is capable, that is to say, of scrutinizing and criticizing his mental self, of approving or condemning his thoughts and conduct, of gauging his intellectual capacity, of contemplating his past history, and reflecting upon his future destiny.

Now, self-examination, if kept within judicious bounds, serves a useful purpose, but if it transgress these limits it may do more harm than good. No one can doubt the beneficial results of keen and searching self-scrutiny, but, necessary though it is, it may be carried too far: here, as everywhere, safety lies in the "golden mean," perhaps, in this case somewhat harder to find than in some others. Self-examination is a process which easily deteriorates into morbid self-analysis, and instead of fostering the formation of a lofty character may, carried to excess, suck at the springs of life and produce a self-engrossed and most undesirable attitude of mind. For this reason I would enter a protest against all

such religious methods as tend to foster unduly in the young the habit of turning the mind in upon itself. As the period of puberty—one of the critical periods of life—approaches, mental activity is apt to increase with marvellous rapidity, and, in the imaginative especially, the tendency to introspection develops itself naturally and quite fast enough without any aids from without. To seek to increase it may be to sow the seeds of profound mental disorganization: individuals of tough nervous fibre may bear the strain, but those of delicate nervous organization are totally unable to do so, and though there may be great temptation to impress the mind while it is fresh and plastic, this doubtful gain is obtained at too great a cost if thereby the whole mental and physical being is permanently injured. We should rather seek to check than to foster the tendency to introspection in the young, and to this end the mind should by every legitimate means be attracted away from itself—directed into non-egoistic channels.

Excessive introspection, like excessive attention directed to the body, is characteristic of hypochondria, but probably in this condition the functions of the body, and bodily aches and pains, are more absorbing than the nature of the moral and intellectual self. We have seen that blushing results primarily from excessive self-consciousness of body, but it may also arise from an undue self-consciousness of the mental being. The individual may blush because he fancies others are forming an unfavourable opinion of his abilities, character, or conduct—that they can read his consciousness and see him as he sees himself, or that they are ridiculing his acts. If

he have a good opinion of his mental self at the particular time he fancies others are criticizing him, he most likely will not blush. When a person blushes before strangers it is probable that it is chiefly on account of excessive self-consciousness of body, for complete strangers are felt to be better able to criticize appearance than character; on the other hand, one is more apt to be mentally self-conscious before acquaintances than strangers, for not only is the good opinion of acquaintances more valued, but they are in a better position to praise the good and condemn the evil in us.

Excessive Self-consciousness of either kind involves Selfishness.—The individual whose attention is absorbed in self has little time to think of others, and hence the nobler altruistic emotions have small chance of proper exercise and development. The excessively self-conscious man is therefore apt to sink to the level of the primitive man of pre-social times, and his case affords an example of the principle that all disease is dissolution—an undoing of evolution. Excessive self-consciousness is undoubtedly a disease of mind, and the victim of it, sinking from that high level of morality which teaches that one should spend and be spent for others, lives for himself alone,—in the language of evolution, he reverts to a former type.

Shyness the great Cause of Pathological Blushing.—In the three mental states inducing blushing—shyness, shame, and modesty,—self-consciousness is

[1] See *Ibid.*, p. 331.

the essential element. Of the influence of shame and modesty I need say nothing, since blushing arising from these causes is normal: from the pathological point of view shyness is the chief cause. The shy individual is excessively conscious either of his mental or his bodily self, perhaps of both; but such self-consciousness, though essential to, does not of itself constitute, shyness: in order to feel shy he must, for the time being, hold himself in low—or at all events, not in high—estimation. He that has a good opinion of his mental or bodily self is never, while imbued with this opinion, shy. A third element is, however, necessary to shyness, viz., sensitiveness in regard to the opinion of others. A highly self-conscious individual may form a low estimate of himself, and yet, not being sensitive to other people's opinions, will not be shy: he will be simply indifferent. The habitual blusher is always very sensitive, and very prone to take offence. Shyness, therefore, appears (to me) to rest upon three things: *a*, excessive self-consciousness; *b*, want of self-esteem; *c*, undue sensitiveness to the opinion of others.

Apprehension of Blushing a Cause of it.—Duboux[1] thinks that Darwin has overlooked one important cause of blushing, viz., the fear, apprehension, or dread of it. (Such a dread implies, of course, excessive self-consciousness.) "Suppose an individual to blush for the first time from one of the causes mentioned by Darwin (such as shame or

[1] "Bulletin de la Société Médicale de la Suisse Romande," 1874, p. 316.

modesty), he is in a painful and humiliating situation when he feels his face thus glowing; he seeks to repress the flush of blood; his efforts are futile and defeat their own ends; the blush only becomes more intense. He is fearful of being again exposed to a similar confusion: the very apprehension and effort to resist cause a blush more intense than that of shame. He now knows that the fear of blushing suffices to excite blushing. . . . . The time may, indeed, arrive when this fear will cause him to blush when alone and unobserved." He goes on to say that this influence of dread in causing that which we desire to avoid is not peculiar to blushing. In his own case the mere fear of something or the effort to prevent it tends to cause it; and conversely, the mere wish for a thing or the attempt to bring it about will prevent it, and he gives a number of examples. The following cases bear out the truth of Duboux' remarks:—

Æt. 29 (woman). Suffers from inordinate blushing. Is not nervous in any other way. Since her seventeenth year, when she had scarlatina badly, has been subject to intermittent albuminuria. The blushing commenced when 19. Blushes at breakfast before her own family. *At dinner-parties she will sometimes be suddenly seized with a panic that she will blush, and with a strong desire to leave the room. The panic will bring on the blushing.* Is not troubled at balls or evening parties in the same way, but very much at afternoon entertainments, especially in her own house.

Æt. 33 (woman). Subject to constant blushing. Would not be shy before any one but for this infirmity and *the constant dread of an attack.*

Examples of Self-consciousness.—All the following instances of self-consciousness are taken from my notes on pathological blushing.

a. Examples of excessive self-consciousness of body :—

Æt. 40 (man). Mason and builder. Timid and despondent; thinks people are observing him, and in consequence is afraid to meet them in the street; blushes if he thinks he is looked at, but not otherwise.

Æt. 33 (man). Has lately become unusually shy; contrary to his former habits he seeks solitude, and dislikes to meet old friends, acquaintances, and strangers in the street; fancies people are watching him and making disparaging remarks on his appearance, or displaying a hostile feeling towards him, although he knows it is unlikely they are doing so.

Æt. 29 (man). Foreman builder. Very shy all his life; if he sat forward in church would fancy every one was looking at him alone.

Æt. 35 (man). Builder. Has the feeling of being watched.

Æt. 38 (woman). Is more self-conscious before her two sisters than before any one else, as she knows they are watching her, and in the habit of talking about her.

b. Examples of morbid self-consciousness of the mental being. I could cite two or three cases identical with the following :—

Æt. 28 (man). Champion athlete. Always blushes when he thinks "he will make a fool of himself."

The following case illustrates a very common result of this kind of self-consciousness :—

Æt. 29 (man). Musician. If relating anything, often finds he is thinking more of what the people present may be thinking of him than of his narrative, and consequently forgets what he is talking about.

The influence of active occupation in lessening morbid self-consciousness is shown by the following case :—

Æt. 28 (man). Curate. Very self-conscious, but the more he has to do and the less time to think of himself, the less he blushes.

Having entered into the subject of self-consciousness in some detail, we may now apply the remarks made at the commencement of this chapter on objective thought. I there sought to show that there is no fundamental distinction between a so-called subjective or objective mental attitude. When an individual is pursuing a complex train of thought, dead for the time being to the existence of the external world, his mental condition is essentially the same as when he is engrossed in the external world. He may be as unconscious of self in the one case as in the other. Thus we must not fall into the error of supposing that the contemplative as distinguished from the practical man is necessarily the more self-conscious. A deep thinker need not think much about himself—usually he does not; and, on the other hand, a man of action may be self-centred. Nevertheless, the former is more apt to become abnormally self-conscious than the latter, for he has greater temptation to self-contemplation. A self-conscious individual derives benefit from studies which divert the attention from self, and in this way his condition may be bettered by a judicious choice of literature; but undoubtedly the best antidote to self-consciousness is an active, practical life involving free association with others. Nothing more fosters self-consciousness than solitude, for solitude thrusts a man upon himself. Unfortunately, the self-conscious individual is often shy. He therefore seeks to be alone, and thus his disorder feeds, as it were, upon itself.

Voluntary Blushing.—I have heard of one in-

stance of voluntary blushing. This was in a young woman who held a public appointment, and I am told that she was well known to a large circle of people as a voluntary blusher. I have, unfortunately, been unable to trace this case, but seeing that people have been known to stop the beat of the heart voluntarily, and to influence at pleasure other structures which in the vast majority of the community are quite beyond the control of the will, one can well believe that there may be those who can influence at will the cutaneous vessels of the face. Ed. von Hartmann evidently believes that some possess this power, as the following passage shows: "The facility with which many people blush or grow pale according to desire is well-known,—especially coquettes who lay themselves out to do so (die darauf studieren)."[1]

[1] "Philosophie des Unbewussten." Berlin, 1871, p. 158.

CHAPTER III.

Causes of Blushing—*continued.*—In this chapter I shall give a number of examples of the most common circumstances of everyday life under which morbid blushing occurs.

Blushing usually takes place more readily before strangers than before acquaintances, and before acquaintances than before intimate friends; also, it nearly always occurs more readily before one of the opposite than one of the same sex. The following cases illustrate these truths:—

Æt. 33 (man). Always blushes when he goes into a shop where young women are serving.

Æt. 32 (man). Blushes when talking to customers.

Æt. 24 (man). Blushes when talking to customers, or if he meets any one in the street; always blushes most readily before women.

Æt. 19 (man). Blushes frightfully when standing behind the counter serving customers.

Æt. 25 (man). Blushes in the society of women; not of men so much.

Æt. 32 (man). Blushes in company, especially if women are present.

Æt. 27 (man). About to be married, yet blushes most painfully in the society of his betrothed.

Æt. 21 (man). Always blushes before women; he even feels restless and uneasy *in the presence of men of effeminate appearance!*

Sometimes the tendency to blush is greater before acquaintances than before strangers. As already remarked (p. 150), the exciting cause is not in both cases the same. This is in some cases because the opinion of the former is more valued, or at all events because there is a greater sensitiveness in regard to it. Thus a gentleman tells me that when at school he was always highly nervous when he had to read the prayers before his schoolfellows, but felt no embarrassment while reading the lessons in a church where he was little known. Such cases are common.

Æt. 29 (woman). Blushes intensely before her own pupils.

Æt. 27 (man). Blushes as much before his own family as before strangers.

Æt. 29 (woman). Blushes at breakfast before her own family.

Æt. 29 (woman). Blushes in the morning when she appears before her aunt at breakfast; also before her pupils.

Æt. 31 (man). Even if his wife speaks suddenly or unexpectedly to him the blushing will come on. If his employer, who is very kind and considerate, comes into the office and makes a remark to him, he will blush intensely. He does not blush before his fellow-clerks, seven in number.

Æt. 28 (man). Curate. Blushes much in church when he has to officiate before his rector. When the latter is absent and he has to take entire charge of the services, he does not blush so much.

In these last two cases the subjects were apparently highly susceptible before some one person whose good opinion was probably highly valued.

The more isolated the individual, the more he feels himself to be observed; and consequently the more apt is he to blush. It is for this reason that going into a shop, especially if the attendants are of the

opposite sex, is so often such an ordeal to the inveterate blusher.

Æt. 40 (man). Finds it very trying to meet any one in a country lane when he is by himself; would not be so embarrassed if with some one else at the time.

Æt. 50 (man). Very apt to blush if occupying a prominent position in church, but would not blush in the pit of a theatre.

The extraordinary readiness with which some people blush is shown by the following cases:—

Æt. 44 (man). Has been very shy for upwards of 20 years. He can scarcely face a stranger or a woman without blushing. The dread of this prevents his doing many things. *The mere mention of the word will set up a blush!*

Æt. 28 (man). Telephone clerk. Has been shy from childhood; cannot concentrate his thoughts, and is so nervous and confused that he has the greatest difficulty in facing any one in business. He blushes on the slightest occasion, *even when speaking to people through the telephone!*

Times at which Blushing occurs. The Influence of Solitude and Darkness.—Blushing occurs much more readily in the light than in the dark, and in some cases at particular times of the day. Thus—

Æt. 29 (man). Very liable to blush, even before his own family. *He never blushes at breakfast; but always at dinner.*

Æt. 19 (man). Chemist's assistant. Suffers from uncontrollable blushing; has frightful mental suffering when standing behind the counter serving customers, the blood rushing to his face and making it "look like a fire." *This blushing generally begins at about* 5 P.M.

The following cases illustrate the fact that darkness, which conceals the face of the individual, is apt to check blushing:—

Æt. 33 (man). Formerly a soldier; is bold and strong, but very shy, and an inveterate blusher. During the day cannot on

this account meet a stranger in the street, or enter a shop where young women are serving, however necessary and urgent his business. "In the dark of the evening likes to meet young lady friends," as he does not blush then.

Æt. 22 (man). Cannot go into a shop where there are women, or speak to one in the street without intense blushing and confusion of mind. If he meets them in the dusk, or at night in the dark, he does not feel these symptoms.

Æt. 24 (man). Inveterate blusher. Does not blush when alone, or in the dark.

Æt. 29 (woman). Blushes so much that she avoids going into society and keeps much alone. Blushes before her near relations; also before total strangers, at church, and even in an omnibus, but never in the dark.

Æt. 33 (woman). Blush is preceded by a sensation at the pit of the stomach. If spoken to suddenly in the dark will have the sensation, but no blush.

These cases bear out Darwin's view that self-consciousness directed to the personal appearance is the primary and essential cause of blushing. Necessarily such self-consciousness is much greater in the light than in darkness, for then the countenance is hid and the individual feels safe from observation; he has, in fact, that concealment which he seeks to obtain by manifold movements when he blushes in daylight. For the same reason many shy people would have much less shyness before company if they could wear a mask, for then the face would be concealed. I remember once witnessing an attempt at dramatic representation by a number of boys ranging from twelve to fourteen years of age. When the moment to begin arrived, one or two made a feeble attempt at a start, but suddenly there was a general stampede, only two remaining on the stage, and it is interesting

to note that one of them wore a mask while the other had his face blacked. The latter was certainly the braver of the two.

According to Perty,[1] blushing never occurs when one is alone, or in the dark: one must be observed. Similarly, Hagen[2] observes: "Blushing never occurs when we are alone. Any one can prove this for himself. On reading anything that excites the emotion of shame let him look in the glass and (if he is alone) no blush will be seen." He also maintains that blushing does not occur in the dark. "Every one knows at once when he is blushing by the heat which mounts to his face, and a certain feeling of fulness in it. Many personal experiences have convinced me that this feeling never occurs so long as a room is dark . . . . from which it follows that blushing does not occur unless one is actually observed."

As a matter of fact, however, blushing may occur in the dark. Darwin instances such cases, and I have met with two or three. It may also occur in solitude. The following are instances:—

Æt. 33 (man). Blushes at his own thoughts in solitude or in the dark; often dreams he is blushing.[3]

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[1] "Die Anthropologie," etc. Band i. p. 302. Leipzig, 1874. "Die Schamröthe tritt nie ein wann man allein ist, auch nicht im Finstern, man muss gesehen werden."

[2] "Psychologische Untersuchungen." D. F. W. Hagen. S. 46. Braunschweig, 1847.

[3] This case recalls a passage in Addison's amusing essay on "Ithuriel's Spear," *The Tatler*, October 14, 1710. Ithuriel's spear being of celestial temper, had such a secret virtue in it, that whatever it was applied to, immediately flung off all disguise, and appeared in its natural figure. . . . . I could not forbear thinking how happy a man would be in the possession of this spear. . . . . These thoughts made very lively impressions on my imagination . . . . and produced in me the following dream: I was no sooner fallen asleep, but methought the angel Ithuriel appeared to me, and, with a smile that still added to his celestial beauty, made me a

Æt. 25 (man). When alone, often blushes at his own thougnts, especially if he thinks he has been "making a fool of himself" before his fellow-servants.

Speaking of the effects of darkness and solitude on blushing, Darwin says: "The fact that blushes may be excited in absolute solitude seems opposed to the view here taken, namely, that the habit originally arose from thinking about what others think of us. Several ladies who are great blushers, are unanimous in regard to solitude; and some of them believe that they have blushed in the dark. From what Mr. Forbes has stated with respect to the Aymaras, and from my own sensations, I have no doubt that this latter statement is correct. Shakspeare, therefore, erred when he made Juliet, who was not even by herself, say to Romeo (act ii. sc. 2):—

> 'Thou know'st the mask of night is on my face;
> Else would a maiden blush bepaint my cheek,
> For that which thou hast heard me speak to-night.'"

In defence of Shakespeare it may be observed that sometimes a most inveterate blusher will not blush in the dark under the circumstances which during daylight provoke intense blushing, and Juliet might have been one of this class. Furthermore, the speech of Juliet does not necessarily signify that she was not blushing. Strictly speaking, a blush cannot *bepaint*

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present of the spear which he held in his hand; and disappeared. To make trials of it, I went into a place of public resort.

"The first person that passed me, was a lady who had a particular shyness in the cast of her eye, and a more than ordinary reservedness in all the parts of her behaviour. She seemed to look upon man as an obscene creature, with a certain scorn and fear of him. In the height of her airs I touched her gently with my wand, when, to my unspeakable surprise, she fell in such a manner as made me *blush in my sleep*," etc.

the cheek in the dark, for the physical conditions which underlie the so-called colouring of an object and which consist of a peculiar commotion of ether waves do not then obtain. But Shakespeare may have been more accurate than he knew.

CHAPTER IV.

Causes of Blushing—*continued.*—**Morbid Sexual Conditions.**—In some of my cases of pathological blushing occurring in men masturbation had been, or was still being, practised, and in these cases probably helped to induce the abnormal tendency to blush.

Very few authors of note have seriously dealt with the subject of masturbation. Sir James Paget who handles it with his accustomed skill finds himself reluctantly forced to the conclusion that masturbation, if not carried to excess, is no more harmful than the natural act—that the evils resulting from sexual excess are one and the same be the means of gratification what they may, natural or otherwise. The researches of Ultzmann, Curschmann, Kaula and others would seem to show that long-continued and oft-repeated excitement of the male genitals sets up a chronic hyperæmia of the prostatic urethra and prostate; and this is supposed to cause reflex disturbance, just as (so it is argued) disease of the cervix uteri and uterus may. It is pointed out that the prostate and uterus are both very rich in nerves which in each case come from the same nerve-plexus; and further that the prostate is supplied with nerve

ganglia and Pacinian corpuscles which are only found in very sensitive tissues. These several facts certainly suggest that any affection of the prostate would be likely to set up reflex disturbance. There is, however, so far as I know, no evidence that the hyperæmic condition of which Ultzmann speaks is more readily induced by masturbation than by excessive connection. So far as the direct bodily effects of masturbation are concerned I think there can be little doubt that Paget's view is correct. I am nevertheless convinced that those who practise this vice are far more apt to injure themselves than others. And this for two reasons. (1) The masturbator is more likely to carry his sexual excesses to an inordinate length than he who gratifies sex naturally. He often masturbates from a very early age, long before the natural process is possible, or at all events likely to be indulged in; and the irritating and exhausting effects of these early excesses on a rapidly developing nervous system, cannot fail to interfere with its proper evolution. The most inordinate sexual excesses, if indulged in for the first time after full sexual maturity has been reached, can produce no such injurious effects. (2) Masturbation acts *indirectly* on the body, through the mind, in a manner which the normal exercise of the sexual function does not. For the knowledge that a low, contemptible vice has been practised is apt to prey upon the mind and to foster the habit of morbid self-consciousness. Many coarser natures are little affected in this way, but those of more delicate nervous organization, and above all those who by nature are unduly self-conscious, may suffer agonies of mind

from a contemplation of their conduct. It may happen that such a one over-estimates the ill-effects of the practice which, perhaps, he has long since abandoned, and travels through life with the belief that there is an indelible stain upon him, or that he has damaged himself beyond recovery. It is this type of individual who seeks advice in every direction and sooner or later falls into the hands of the charlatan. It should be noticed that such, apart altogether from their having masturbated, offer a favourable mental soil for these morbid beliefs, and it may safely be said of them, that the habit of masturbation, even though it may not have injured the body, has yet indirectly done so through the mind, for it is well-nigh impossible to get a healthy body united to a mind which is morbidly self-conscious. Individuals of this type have naturally a weak nervous system, and above all a defective mental organization, for a mind that cannot escape from the thraldom of a fixed idea is defective. Among healthy persons ideas are continually flowing along the current of consciousness, but each is estimated at its true value; but with the individuals in question one idea obtains the mastery over all others. One of the first evidences of mental deterioration is the tendency to attach undue importance to certain ideas or trains of ideas—there is an upset of that delicate balance among the various ideas which belongs to a healthy and vigorous mind.

There can be little doubt, I think, that masturbation tends to increase self-consciousness. It has been termed the "solitary vice," and a vice that is indulged secretly and in solitude, more especially

one which is practised on the body, must necessarily tend to develop that self-attention which plays such an important part in the causation of blushing and other forms of nervousness.

Wherefore we may sum up the evil effects of masturbation as follows: Owing to its frequent indulgence at an early age, there is premature sexual excitement, and this tends to interfere with the proper evolution of the nervous system. Further the nature of the vice is such that it tends to develop inordinate self-consciousness—a condition of mind which opens the door to a host of functional nervous disorders—pathological blushing among the number.

Apart from moral grounds there are, therefore, distinctly practical reasons why the vice should be strenuously fought against—why urgent steps should be taken to protect the *individual against himself*. For the tendency to *masturbate is instinctive in many boys* and a few girls. Many masturbate without being taught—much as dogs, stallions, and monkeys do. The habit appears, in fact, to be common throughout the animal world, and there is little doubt that man inherits the tendency from a far-off ancestor. Such thoughts as these should induce us to take every means to prevent the acquisition of the habit. I do not propose here to describe the various means that should be adopted but I would point out the importance of taking steps to remove an undue tendency to priapism in a child. Such priapism points to some source of reflex irritation, the most common being a too long prepuce leading to irritation of pent-up smegma, a loaded

rectum, but above all, thread-worms infesting its lower parts.

Family History.—An excessive predisposition to blush, like every other mental and bodily peculiarity, tends to be inherited. In the following cases a family history of blushing was volunteered :—

Æt. 44 (man). Father, who is over 60 years of age, much afflicted with blushing; also his eldest half-brother.

Æt. 25 (man). Has several cousins, male and female, much addicted to blushing.

Æt. 27 (man). Father troubled in the same way as himself with blushing.

The following remarkable case of inherited blushing was observed by Sir James Paget while examining the spine of a girl :—"A big splash of red appeared first on one cheek, and then other splashes, variously scattered over the face and neck. He subsequently asked the mother whether her daughter always blushed in this peculiar way ; and was answered, 'Yes, she takes after me.' Sir J. Paget then perceived that by asking this question he had caused the mother to blush, and she exhibited the same peculiarity as her daughter."[1]

Age at which Blushing occurs.—Blushing never occurs under a certain age. It probably first makes its appearance between the age of 2 and 3 years, its advent marking the evolution of some one or other of the emotional states capable of exciting it, probably shyness. Idiots, who are incapable of feeling these emotions, never blush. As self-conscious-

[1] Darwin, *ibid.*, p. 312.

ness develops, the tendency to blush increases, probably reaching its maximum at puberty. The process of hardening through which most people go in their commerce with the world generally lessens the tendency again. "A man of the world," writes Hagen, "scarcely ever blushes."[1]

Some continue to blush in extreme old age, the tendency, it is said, generally lasting longer in women than in men; nevertheless I have more frequently noticed, or probably I ought to say, have been more frequently struck by, blushing in old men than in old women. Many cultivated shy men continue to blush to the end of their lives. Duboux has known men "eminent in politics and science, and among others a celebrated physiologist," exceedingly prone to blush.

Sex.—The female sex is more apt to blush than the male.

The Colour of the Skin.—The dark-coloured races are known to blush. Burgess often observed the scar in a black servant change colour under circumstances which ordinarily induce blushing. Of course the more marked the pigment, the less evident the blush. In those with a fair smooth skin the crimson colour stands out vividly; therefore the fair-skinned blusher may derive double advantage from spending much time out of doors; for not only will the general nervous health in this way be improved, but the cutaneous pigment—especially in summer-time—be increased.

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[1] Psychologische Untersuchungen," p. 55.

I am not able to draw any conclusions from my cases of blushing as to the influence of complexion on the tendency to blush. The complexion was noted in *eight* cases only, and six of these, contrary to what one would have expected, were dark, one had the peculiar complexion that goes with red hair, and one was florid. According to Burgess albinos are very prone to blush. He also states that those "with red hair and florid skin, those of sanguine temperament, and those with smooth transparent skin and of consumptive tendency" are usually predisposed to blush.

Tylor[1] alludes to the influence of the complexion in masking or revealing the blush in the following passage:—"The difference between light and dark races is well observed in their *blushing*, which is caused by the rush of hot red blood into the vessels near the surface of the body. Albinos show this with the utmost intenseness, not only a general glow appearing, but the patches of colour being clearly marked out. The blush, vivid through the blonde skin of the Dane, is more obscurely seen in the Spanish brunette; but in the dark-brown Peruvian, or the yet blacker African, though a hand or a thermometer put to the cheek will detect the blush by its heat, the somewhat increased depth of colour is hardly perceptible to the eye."

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[1] "Anthropology," by E. B. Tylor, D.C.L., F.R.S., p. 68.

CHAPTER V.

For convenience, we may divide the blush-storm into three stages :—

a. The stage preceding the development of the actual blush.

b. The stage corresponding to the period of the actual blush.

c. The stage following the disappearance of the actual blush.

The term *blushing* refers, in ordinary language, to a reddening of the face and adjoining parts, in response to certain emotional changes. This local vaso-motor dilatation, like that which occurs in a flush, constitutes, however, but a part, and that a very small part, of what is in its entirety a very widespread and highly complex nerve-storm. When the storm is not severe, the actual blushing may be slight; in the more violent attacks it is usually much more intense. Nevertheless, as in the case of flushing, there is no constant ratio between the severity of the storm and the degree of blushing: all the accompaniments of the external blush may be fully developed, and the nervous system stirred to its very depths and yet very little blushing may occur; and, on the

other hand, an individual may blush intensely without experiencing in any marked degree the usual internal symptoms attending a blush. In the one case we must suppose that, owing to anatomic peculiarities, those nervous processes in the highest centres which underlie the emotions that call forth blushing readily cause dilatation of the facial vessels, while in the other the anatomical arrangement is such that these vessels are much less readily affected.

That the crimsoning of the face constitutes only a part, and not even the essential part, of the general nervous perturbation scientifically designated blushing (for we cannot regard the mere *blush* as an isolated phenomenon) is shown by the fact that during this state the facial vessels may undergo contraction instead of dilatation. Thus Darwin records the case of a lady who while experiencing all the feelings peculiar to blushing actually became pale.

Preliminary Phenomena of the Blush.—Sometimes the blush occurs without any very noticeable preliminary phenomena. As a rule, however, it is heralded by distinct symptoms, and in some cases, all the general symptoms of the blush precede the reddening of the face. According to Burgess[1] a peculiar, indescribable feeling of helplessness precedes the blush. The entire body is pervaded with a glow; there is mental confusion, the eyes languish, the head hangs, the heart throbs, the breathing becomes affected, there is a stifled feeling,

[1] "The Physiology or Mechanism of Blushing," by T. E. Burgess, p. 134. London, 1824.

and the voice sounds changed. My own notes record the following premonitory symptoms:—A peculiar feeling at the epigastrium, palpitation, breathlessness, a constriction at the throat, with alteration of voice, and distinct mental confusion or dread.

The sensation at the epigastrium occurring in connection with the blush was remarked by Burgess.[1] He says: "The individual often feels a peculiar sensation similar to the epileptic aura rising from the precordia upwards," but he does not mention it as a premonitory symptom With my patients it *always* preceded the blush. The following are examples of such epigastric auræ:—

Æt. 31 (man). The blush is preceded by a knock or rush at the pit of the stomach, and a rapid rising upwards of a flush which appears to come from there, and quickly spreads over the face and head.

Æt. 25 (man). The attack is preceded by a sudden sensation at the pit of the stomach rising rapidly upwards.

In both these cases the aura was strictly akin to the epigastric aura which so frequently occurs in connection with ordinary flushes, and it might well be asked whether they are not both instances of true flushes. That they were simple cases of blushing there can, however, be no doubt, for both patients were excessively shy and self-conscious, and in both, the attacks occurred under circumstances which ordinarily induce blushing—in the second case, simply from thought ("blushed at my own thoughts").

Yet more common among blushers than the epigastric aura is the cardiac aura. In all the following

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[1] *Ibid.*, p. 134.

instances the blushing was preceded by some peculiar sensation referable to the heart, *e.g.*, palpitation. Each case was undoubtedly one of true blushing.

Æt. 28 (man). The blush begins with, or is slightly preceded by, a peculiar feeling at the heart, followed by palpitation.

Æt. 33 (woman). The blush is preceded by palpitation.

Æt. 27 (man). Blush is preceded by sharp pain at the heart, with palpitation.

Æt. 27 (man). Blush preceded by throbbing of the heart.

Now if during the ordinary emotional states which induce blushing the centres representing the epigastric and cardiac regions are discharged, is it any wonder that in disease these centres should display a peculiar tendency to disturbance; and that auræ arising in the epigastric and cardiac regions should be so common?

In the following case the aura started from the feet and spread upwards. I cite it in full in order to show that it was one of undoubted blushing, and to enforce my assertion that it is practically impossible to make any sharp distinction between flushing and blushing.

Æt. 32 (man). Formerly a farmer, but now a minister. Robust looking and in excellent general health. Feels confused on entering company, especially if ladies are present. His greatest difficulty is in his church. He can go through the prayers and reading without difficulty, but when standing up to give out the hymn, which he has to read before it is sung, a feeling of dread comes over him, *with a peculiar sensation like tingling, which commences in both feet and quickly passes upwards* all over him till it covers his face, neck, ears and head with a burning flush. He is then so confused in mind that he does not recognize the sense of what he is reading, although able to utter the words mechanically. He has such a dread of this occurrence in church that he has latterly entirely given up duty.

Dread.—In the case just quoted it will be observed that the patient experienced a feeling of dread. Other patients complained of the same feeling before the attack. Sometimes the emotional state heralding the attack is vaguer: thus one patient complained that his attacks were always preceded by "panic"; another that he had a "feeling as if the attack were imminent." The feeling of dread is, however, most common. This fact is interesting. We have seen that shyness is the most common cause of blushing, and that it is, as the etymology of the word suggests, closely akin to fear—not necessarily physical fear, for the bravest in physical danger may be very shy, but a condition closely allied to it. We have also seen that shame is closely allied to fear; and such being the case, it is interesting to observe that a feeling of intense dread not infrequently heralds the attack.

In this connection also the epigastric and cardiac auræ become interesting to us. Feelings referable to the heart and epigastrium are very common in strong emotion. In sudden fright, for instance, a knock is often felt at the epigastrium, and the heart —as everybody knows—is peculiarly influenced by emotional states. Few will dispute Hughlings Jackson's contention that the physical substratum of what on the psychical side is an emotion, consists of "nervous arrangements" representing (chiefly) the circulatory apparatus and the viscera.

Breathlessness, inability to speak, and constriction of the throat, all of which are apt to occur in strong emotion, more particularly in the depressing

emotions, such as fear, not unusually precede and accompany actual blushing. The two latter preceded the blush in the following case :—

Æt. 33. Governess in charge of five children. Highly nervous and emotional. Was once in a railway accident, since which she has been worse. Gets on very well with the children in the school-room, but in constant dread of joining the family in the drawing-room as she blushes most painfully in their society. The moment her hand is on the handle of the door, *her heart commences to beat violently, she feels a constricted sensation in the throat*, her face up to the roots of her hair becomes full of blood, her senses get confused, and if spoken to she *cannot* answer, partly from this cause, and partly *from loss of voice.*

CHAPTER VI.

Phenomena accompanying the Actual Blush (or Redness of the Skin).—*The Redness of the Skin.*—We may consider this under two heads:—*a.* The mode and rate at which the redness distributes itself; *b.* The area affected by the redness.

a. The mode and rate at which the redness distributes itself. According to Hagen[1] the blush occurs simultaneously in all the parts affected. This no doubt may happen, especially in the slighter blushes; more frequently, however, the redness may be observed to begin and spread in a definite and sometimes very curious manner. Thus in one case (Fig. 13) it began as a burning round spot at 1. This gradually became triangular, as represented by the dots (2). Another triangular patch then appeared anteriorly to the ear (not at all an uncommon situation). The two patches then gradually enlarged, became irregular in shape, and finally merged into one. I have watched a similar development of the blush in several other cases, and I append drawings of two or three of them. In Fig. 14 the three

[1] "Psychologische Untersuchungen," p. 46.

different shadings represent the development of the blush at different stages. In the case represented by Figs. 15 and 16 the blush began on the left side of the face in several discrete patches which gradually increased till they merged into one another; on the right side (Fig. 16) it began in the neighbourhood of the ear as a somewhat triangularly shaped patch which gradually spread forward over the face.

FIG. 13.

The blush began as a red spot at 1. This then became triangular as represented by the dots (2). A triangular patch next appeared at 3. The two patches then expanded irregularly, and finally merged into a continuous blush on the right cheek. Directly the first spot appeared she noticed a burning in this region. The blush always begins in this way and is usually limited to this side.

Fig. 17 represents a blush which, as in the above cases, began in the form of irregular blotches; these by their union formed a continuous blush, a circular area in the centre alone remaining unaffected. This subsequently filled in.

The commencement of the blush in isolated patches must be due to the implication, at first, of very limited portions of certain continuous vaso-motor centres; and its gradual spread is evidently due to the advance of the discharge along these centres. The rate at which the redness suffuses itself over the skin varies in different cases: sometimes it is so rapid as almost to appear instantaneous; sometimes it is slow, occupying, it may be, several minutes, and

FIG. 14.

Fig. 14 shows three stages of a spreading blush. When first observed its shape was as represented by 1; it then expanded, and occupied the area marked 2, and finally that marked 3.

it need scarcely be said that there is a correspondingly slow or rapid advance of the discharge of the vaso-motor centres implicated. We may compare the advance of a nervous discharge along these to the explosion advancing along a train of gunpowder; why in some cases it should spread slowly and in others rapidly is a question of some

interest, but one which I shall not here attempt to answer.

b. The area affected by the redness. The parts most frequently affected in blushing are the cheeks,

FIG. 15.

The blush begins in patches as indicated. These run together and form a continuous blush.

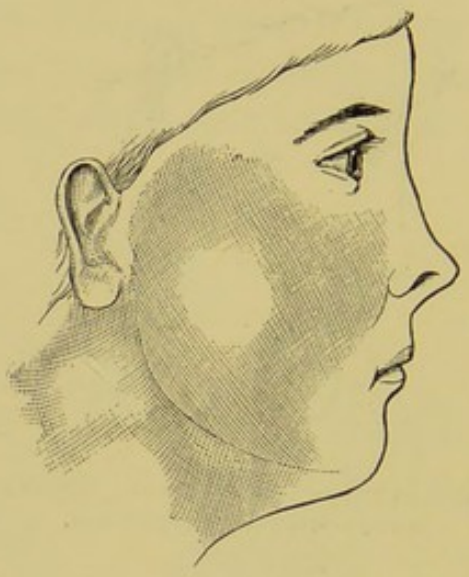
FIG. 16.

The opposite side of same face as 15.

but in severe storms the forehead, ears, hairy scalp, neck, and upper part of the chest and back may be implicated, and sometimes perhaps even the hands.

In pronounced blushing the ears seldom escape, the flushing of their vessels being made manifest to the sufferer by a tingling sensation in them. The great tendency of the ears to redden in blushing was

FIG. 17.



The blush began as several distinct blotches. These gradually merged into one another, forming a blush as represented in the figure, leaving a round patch in the centre unaffected. This subsequently filled in.

remarked by Aristotle. He asks why the ears are chiefly affected in shame, while it is rather the eyes which are affected in anger.[1]

In the milder forms of blushing, when the redness is generally limited to the cheek, its upper margin frequently corresponds to the lower rim of the orbit (Fig. 17). When the blush involves the neighbourhood of the ears and the hairy scalp there is often a distinct interval or line of demarcation between its

[1] *Διὰ τί ὀργιζόμενοι μὲν τοὺς ὀφθαλμοὺς μᾶλλον ἐπιδιδοᾶσι πρὸς τὸ ἐρυθριᾶν αἰσχυνόμενοι δὲ τὰ ὦτα*: Problem, Sect. 3.

margin and these parts. This is also shown in Fig. 17.

Sometimes the blush is limited to certain isolated patches. Such patches, for instance, as I have already described may occur without merging into one another. And just as in flushes one side of the face only may be involved, so also may it be in blushing. I have seen two or three such cases.

FIG. 18.

The redness in this case belonged rather to a flush than a blush. On the other side of face, the upper margin of the redness corresponded more or less accurately to the lower jaw.

Occasionally the blush affects the neck more than the face. In one case that I observed the redness suffused itself irregularly over the upper part of the neck and the circumference of the face, and involved the left side of the face as indicated (Fig. 18).

It would be impossible to describe all the different ways in which the redness may be distributed, nor is there any occasion to do so: it is sufficient to point out how numerous and diverse these are. Before leaving the subject I would draw attention

to the peculiar irregularity of outline which the blush may display. (Figs. 17, 18, 19, 20.)

FIG. 19.

Had irregular blush on left side, as indicated; none on the right side. One week afterwards the same blush was observed. There was no difference in the size of the retinal vessels.

FIG. 20.

Showing serpiginous margin of blush.

Many of the phenomena which precede the actual

blush may continue while it lasts. In the following account mention will only be made of those which according to my notes occurred while the skin was red.

Mental Confusion.—Intense blushing is almost always accompanied by mental confusion. This, as Darwin observes, is recognized in the popular expression, "She was covered with confusion." Most of my notes make mention of this mental confusion. In severe cases it almost amounts to a complete paralysis of the intellect, the individual being unable to pursue a consecutive train of thought. The following are illustrative cases :—

Æt. 33 (woman). During the blush her senses get confused, and partly from this cause and partly from loss of voice she cannot answer if spoken to.

Æt. 25 (man). During the blush he can scarcely trust himself to speak.

Æt. 32 (man). Minister. During the blush he cannot recognize the sense of what he is reading in chapel, although he is able to formulate the words automatically.

Æt. 23 (woman). During the blush she becomes confused and unable to collect her thoughts.

Persons in this condition of mind, Darwin says, often "stammer and make awkward movements or strange grimaces. In certain cases involuntary twitchings of some of the facial muscles may be observed."[1]

According to Tissot the lips quiver, and the individual stammers and stutters.[2] In fact, this author

[1] *Ibid.*, p. 323.

[2] "Abhandlung über die Nerven." Überset. v. Ackerman, Leipzig, 1781, Bd. ii. 2, 341. As quoted by Hagen, *op. cit.*, p. 46.

goes so far as to say that giddiness, tinnitus, and even sudden death from apoplexy, may occur.

Movements prompted by Desire for Self-concealment.—The habitual blusher usually looks down or askance. The head or the whole body is turned away, and the eyes are afraid "to meet the gaze of those present;" occasionally effort is made to overcome this repugnance, with the result that they are restlessly moved from side to side. It is thus also that Darwin explains the tendency to blink during blushing.

Æt. 32 (man). Commercial traveller; unmarried; says none of his family are nervous or gouty; suffers from constant blushing, great shyness, strong disinclination to meet or call on people. Very nervous when talking to customers, with dizziness and confusion of mind, *twitching of eyelids*, trembling of heart, and occasionally entire loss of memory.

It is astonishing how common is the objection to look others full in the face, especially among the educated classes, and more particularly among the overworked in these; the lower orders manifest it less frequently. I venture to affirm that if any one will take the trouble to make careful investigation—let him take, say, a hundred individuals of the well-to-do, cultured classes—he will find that a large number of them will try to avoid his direct gaze. Many are the expedients adopted towards this end. Some habitually address all their conversation to a point on the wall, ceiling, or ground; some will only glance at you occasionally and furtively, as if fearing to be detected in the act; some, again, close or half-close their eyes while talking to you; while others look at you intently but sideways, with the head turned

half away—in the manner known as *glining*. One tall, somewhat shy gentleman of my acquaintance is in the habit of throwing his head back and then directing his eyes downwards towards the person to whom he is speaking. These are some of the devices adopted by that large class of individuals—probably all abnormally self-conscious—who dislike to look any one full in the face.

In severe cases of blushing the desire for concealment may sometimes be so great that the individual will bury his face in his hands, or rush quickly away.

Tremor.—As in flushing so in blushing, there may be a general tremor of the muscles. Thus—

Æt. 44 (man). During blushing his hands shake, and other parts of the body tremble violently.

Æt. 38 (man). Has latterly become so nervous that a step on the stairs leading to his office startles him, and if he is required to do any writing while any one waits he blushes, "his stomach seems to go into a ferment," his heart palpitates violently, and his hands tremble so much that he is almost unable to hold his pen.

Æt. 23½ yrs. (man). Clerk. Has been exceedingly nervous since his fourteenth year. If he has to read or write before his employer he gets so nervous he cannot control himself; even the thought of having to do so brings on an attack. If he has to give a message of any length he may commence all right, but the nervousness is sure to come on after a few words, and he gets quite confused, almost incoherent. A sudden sensation comes on at pit of stomach, followed by trembling all over, palpitation, flushings of face, ears, and head, and inability to guide his hand to write even a line.

This tremor, like that occurring during a flush, is a species of paralysis. Some people who are excessively self-conscious experience such a partial para-

lysis of the muscles if they think they are observed. Under such circumstances it may happen that they are unable to maintain their normal gait, their knees shaking and bending under them.

Hagen[1] points out that the condition of the muscles during blushing suggests a partial paralysis of them : the bowing forward of the body, the bending of the head, the drooping of the eyelids, the trembling of the lips and tongue, and the weakness of the limbs. And it may also be noted that fear, to which, as we have seen, shyness and shame are closely allied, exercises a similar paralyzing effect on the body.

Stimulation of the Lachrymal Glands.—During intense blushing the eyes not infrequently fill with tears. According to Burgess this occurs at the end of the attack. This is due of course to direct stimulation of the epithelial cells of the glands. It is an emotional manifestation, and may be compared to that which occurs during grief. Individuals differ very much in regard to the quantity of lachrymal secretion during blushing: in some it is not increased, in others the tears are more obtrusive than the blushing ; indeed, there are some who, under circumstances which ordinarily induce blushing, simply become watery in the eyes. This I have observed several times. This condition is sometimes quite as trying as actual blushing.

Tingling.—Sometimes tingling is felt all over the body during the blush. This fact has been pointed out by both Burgess and Darwin. In the following

[1] "Pyschologische Untersuchungen." Braunschweig, 1847.

case the tingling was followed by the development of a rash :—

Æt. 52 (woman). Subject to blushing, which is as bad in her own family circle as in society. Sometimes it is so intense as to cover her neck and chest and to extend to her hands *with a tingling sensation over all*, followed by a well-marked rash which remains for a short time.

This general sensation of tingling is interesting, showing us, as it does, that in blushing the cutaneous phenomena are not confined to the vaso-motor dilatation of the vessels of the face. It may be compared to the widespread sense of heat sometimes felt in an ordinary flush, and which, as observed, may be due to cortical changes pure and simple, independently, *i.e.*, of any actual changes in the skin. How far the sense of tingling in blushing is purely central, and how far it results from peripheral changes I cannot say, but the fact that it was in the above case followed by a rash suggests that it may be connected with some actual nervous changes occurring in the skin.

Palpitation has already been mentioned as sometimes heralding the blush. It very frequently occurs *with* it. A number of my cases illustrate this fact. Breathlessness and constriction in the throat are less common symptoms of the blush, but like most, if not all of them, may be sometimes noticed before the actual blush is observed.

Perspiration occurred in some few cases. Thus—

Æt. 24 (man). When the blushing is intense his heart "beats with terrific force," and his face becomes wet with perspiration.

Æt. 35 (man). Fancies every one is looking at him in church, blushes, gets confused and breaks out into a profuse perspiration.

CHAPTER VII.

Phenomena succeeding the Stage of Redness.—Burgess points out that the blush may be succeeded by pallor of the face.[1] Similarly, Hagen, who had not apparently read Burgess' essay, writes: "When the blush begins to vanish, the natural colour of the face returns or it becomes pallid."[2] I have already quoted the lines of Racine, in which he says: "*Je rougis je pâlis*," recognizing the fact that pallor frequently succeeds the redness. This fact, which I have repeatedly noticed, is interesting. It will be remembered that ordinary flushes are frequently followed by a cold stage, during which there is constriction of the cutaneous blood-vessels, the face being often distinctly pale. There can therefore be little doubt that the pallor which succeeds the ordinary blush is analogous to the cold stage of the flush.

While the blush is disappearing, or during the succeeding pallor, the face may be again suddenly suffused; and this may happen several times. If the blush is intense it may be followed by prostration, which may continue for a long time. As a rule,

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[1] *Ibid.*, p. 178. [2] *Ibid.*, p. 46.

however, the symptoms rapidly pass away with the disappearance of the blush.

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Artificial Blushing may be briefly alluded to here. In 1874, Ludwig Meyer described a peculiar reddening of the skin which he designated artificial blushing.[1] The following is an epitome of his two cases :—

Æt. 33 (woman). Insane. While Meyer was listening to the patient's heart, she turned her head to the right, and thus brought the right cheek in contact with the corner of the pillow. This slight touch caused a burning redness on the upper part of the neck and the lower part of the cheek, near the angle of the jaw—in the parts, namely, which had been impressed by the pillow. Meyer then found that gentle stroking with the finger, or with the bedclothes, caused a similar redness to appear on the cheeks, throat, and neck. After a short time the spots of redness disappeared from their circumference towards the centre. Similar spots would suddenly appear on the cheek without any evident contact, and as suddenly disappear. How far the skin of the rest of the body displayed a similar tendency Meyer was not able to discover, owing to the unfavourable condition of the patient.

Æt. 33 (woman). Insane. In this case also the skin of the face and neck responded in a similar way to contact. Although the extent of the redness was greater than the surface touched, yet they so corresponded in form that it was possible to draw figures and write letters on the skin. The covered parts of the body failed to respond in the way indicated.

Meyer points out that the reddening in these cases differed from Trousseau's *tâche cerebrale* in that it was capable of being called forth by the slightest contact, in its very rapid, almost instantaneous development, in its highly evanescent character—not

[1] "Archiv für Psychiatrie und Nervenkrankheiten." Berlin, 1874, p. 540.

lasting for more than two seconds, and finally in its limitation to the face, neck, and throat. He accounts for this limitation by the fact that the vessels of these exposed parts are very susceptible to dilatation, and he agrees with Darwin's explanation of this circumstance.

A very similar case was subsequently recorded by Kelp,[1] but in his patient the phenomena could be produced on the arms and chest.

[1] *Ibid.*, 1875, p. 578.

PART IV.

TREATMENT.

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CHAPTER I.

Flushing and morbid blushing must not be regarded as by themselves constituting diseases, but rather as manifestations of some general defect—temporary or permanent—in the nerve centres: wherefore our treatment should be directed to the remedy not simply of the flush or blush, but of the general nervous defect of which they are the expression. A person who suffers from flushes does not suffer from them alone, but is the victim of a long train of other nervous phenomena,—his whole nervous system is out of gear. And similarly, it cannot be said of the inordinate blusher that the mere tendency to blush on the slightest occasion is the sum total, the beginning and the end, of his disorder. There is in his nervous system a radical fault, and one indeed of a much more serious kind than in the case of the flusher. It frequently rests upon an inborn weakness which expresses itself in many other ways than by blushing.

It may seem self-evident that we should, in flushing and blushing, treat the general condition and not

the symptoms merely, but is this principle always acted upon? Is it, for instance, in epilepsy, neuralgia, asthma and all the so-called functional nervous disorders? Are they not rather looked upon generally as separate and independent diseases? Yet they, as much as flushing and blushing, are in reality differing manifestations—determined by individual peculiarities—of a radical defect in nervous organization, a defect not limited by any means to the centres primarily engaged in the particular nervous storm by which it makes itself felt, but ramifying through the entire nervous system. No one can suppose that the actual epileptic fit constitutes the whole of the abnormalities of nervous function to which the epileptic is liable.

Instead, therefore, of confining my remarks to the mere treatment of symptoms, I shall take this opportunity of setting forth what I conceive to be the general principles which should guide us in our treatment of nervousness in all its forms; my remarks will, in fact, deal with what I may call "the philosophy of the treatment of nervousness." At the end, however, I shall append a brief account of practical treatment.

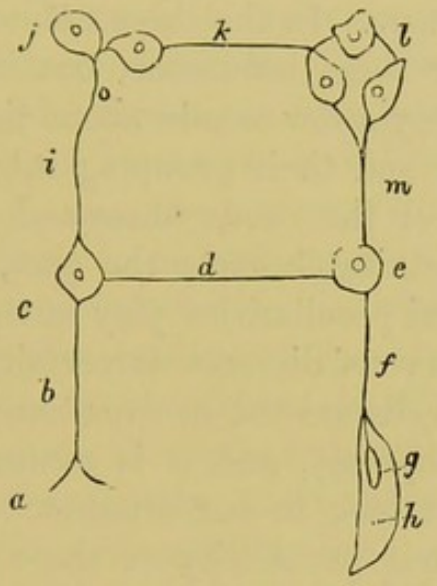
The nervous system is made up of ganglion-cells, of nerve fibres (which are merely the prolongations of the cell processes, enveloped in one or in two sheaths) and of nerve-endings.

The ganglion-cells are connected by their processes into centres, and these again, either directly, by means of the cell processes themselves, or indirectly, through the intermediation of the nerve fibres, with other centres. The accompanying diagram

represents a miniature nervous system as thus constituted.[1]

An impulse passing from *a* may contract the muscle, or explode the zymogen, of the epithelial cell through the lower reflex arc *b*, *c*, *d*, *e*, *f*, or through the upper reflex arc *b*, *c*, *i*, *j*, *k*, *l*, *m*, *e*, *f*, in the latter case consciousness intervening. I have supposed the efferent

FIG. 21.



a = Nerve-ending.
b = Afferent nerve.
c = Lowest sensory centre.
d = Nerve fibre connecting *c* with *e*.
e = Lowest motor centre.
f = Efferent nerve.
g = Motor nerve-ending.
h = Muscle (or epithelial) cell.
i = Afferent fibre connecting *c* with *j*.
j = Ferrier's cortical sensory centre.
k = Fibre connecting *j* with *l*.
l = Ferrier's cortical motor centre.
m = Fibre connecting *l* with *e*.

part of the arc to belong to the muscular nervous system only, but there are of course other efferent strands, chief among which are those passing to gland-cells and controlling their action.

Each ganglion-cell is a more or less independent

[1] The above diagram takes no account of Hughlings Jackson's "highest" centres. I am not aware that any centres corresponding to *c* have been discovered, but, with Jackson, I assume the existence of such.

organism, which, like the amœba, lies bathed in a fluid from which it derives its food (including oxygen) and to which it returns its refuse.

Wherefore it follows that the ganglion-cell may be influenced from without in one of two ways:—(1) By the plasma bathing it; (2) By nervous impulses striking it through its processes. In other words, *the environment of the cell is made up of plasmic and of nervous influences.* In the three following chapters I shall consider these influences, but it will be first necessary to say a few words about the structure of ganglion-cells and their grouping into centres. Of the structure of the nerve fibres and nerve-endings I need say nothing, because the part, if any, which their structural peculiarities play in the causation of functional nervous diseases is certainly subsidiary: the ganglion-cells are the evolvers[1] and co-ordinators of nervous impulses, and it is essentially to these that we must look in our attempt to decide what share structural peculiarity of the nervous system takes in the production of its various functional disorders.

1. **Structure of Ganglion-cells.**—We may consider this under two heads,—*a*, discoverable structure; *b*, undiscoverable structure. The former includes all that which may be made out by means of the microscope: the general outline of the cell, the number of its processes, the structure of the nucleus and nucleolus, and the appearance of the protoplasm. The latter includes the arrangement of the atoms

[1] It is possible that the nerve fibres are themselves capable of evolving nerve force, but in an infinitely less degree than the ganglion-cells.

into molecules (the molecules containing hundreds, perhaps even thousands, of atoms) and of the molecules among themselves. It may be objected here that I am trying to make a distinction where none actually exists. It is, of course, on the constitution and the disposition of the molecules that the discoverable structure of the ganglion-cell depends, but microscopic examination tells us very little or nothing about the combination of molecule with molecule, and less still of atom with atom. The word *Structure*, as generally used, refers to the arrangement of matter as we can discern it by the senses, whether artificially aided or not. To suppose, however, that in the world of the infinitesimal structure stops at that point at which we cease to detect it, is absolutely unwarrantable. Taking that portion of space occupied by a single human body as a standard of measurement, have we any reason to suppose that this standard is any nearer the infinitely small than the infinitely great? If we apply a mathematical test, we must, I think, answer in the negative; for though we double our standard measure *ad infinitum* we are no nearer exhausting infinitude in the one direction than by halving it *ad infinitum* we are nearer in the other; for no matter how often we multiply our quantity we still have illimitable space beyond, and no matter how often we divide it, we still have left the half of what was last divided.[1]

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[1] The above statement may be mathematically illustrated thus:— Infinity is $\frac{1}{0}$. Now it makes no difference if we take $\frac{1}{0{\cdot}2}$ or $\frac{1}{0{\cdot}3}$ or $\frac{1}{0{\cdot}4}$ or $\frac{1}{0\times \text{infinity}}$, we still arrive at the same result, *i.e.*, $\frac{1}{0}$ for manifestly 0

Seeing, then, how far we may penetrate into the world of the infinitesimal without reaching its limit, have we not room within our ganglion-cell for structural arrangements as complex as any we can detect by the senses, whether aided or not?—have we not, indeed, good reason to ask whether undiscoverable structure may not be far more complex than discoverable—as complex, perhaps, as the whole discoverable structure of the body? If we approach the subject of ganglionic structure with such thoughts as these, we shall be in a position to understand how a cell may cease to carry on its functions aright, even though no alteration in its structure be apparent.

2. **Grouping of Ganglion-cells.**—The ganglion-cells constituting the nervous system are exceedingly numerous, and in order that they shall act in harmony, it is essential that there shall be proper connection between them, that they shall be properly grouped into centres, and these centres properly connected one with another. For one centre may profoundly influence another, increasing or diminishing its activity; wherefore any imperfection in the ganglionic groupings will tend to disordered action. Nervous health is nothing less than the harmonious working together of all the cells forming the nervous system, in other words, a proper co-ordination of

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multiplied by any number, however small or great, remains 0. Again, if we take $\frac{1}{0\cdot\frac{1}{2}}$ or $\frac{1}{0\cdot\frac{1}{3}}$ or $\frac{1}{0\cdot\frac{1}{4}}$ or $\frac{1}{0\cdot\frac{1}{8}}$ each, as before $= \frac{1}{0}$, *i.e.*, infinity.

ganglionic action, and to this end the ganglionic cells must manifestly be properly grouped.

When an individual inherits a tendency to epilepsy, asthma, or other classical neurosis, it is very probable that the connection between the several centres is somewhere defective, and such structural defect would alone be sufficient to account for these disorders; but it is possible that in these cases of hereditary weakness the ganglion cells are themselves imperfect, and of course the very fact of imperfect connection between them points to one defect at least. It should be noted that in either case there would be no definite lesion.[1]

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[1] Although epilepsy has not hitherto been considered due to any discoverable lesion, it has recently been stated by Bevan Lewis (*op. cit.* 522–525) that distinct ganglionic degeneration is present in this disorder. According to him, the small ganglion cells in the second layer of the cerebral cortex degenerate and eventually disappear, the change beginning with fatty degeneration of the nucleus, and the fat, later, being extruded, and a vacuole left—a process which he terms vacuolation of the cells. He further asserts that these small cells of the second layer are sensory, and in a normal condition exert an inhibitory influence on the large and more deeply seated motor-cells, a point which he considers proved by the incoherent discharge of the latter, when the former have degenerated. With this conviction on the part of such a reliable authority before us, we can scarcely any longer doubt the existence of a discoverable lesion in advanced stages of the disease, but it is still open to question whether it is present in the earlier stages. Presumably all Bevan Lewis's observations were made upon cases of very advanced epilepsy.

In regard to the plasmic environment of the ganglion-cell, I have said that each cell lies, like an amœba, bathed in a fluid, and I am borne out in this statement by Bevan Lewis. He remarks that each of the large ganglion-cells "is enclosed within a circular, oval, or pyriform space," called the *peri-cellular sac*, and he further shows that each is supplied with a special arteriole or capillary, whence arises a delicate loop which encircles the sac.—(*Opus cit.* pp. 81–83.—See also plate v., p. 106.)

CHAPTER II.

1. **Influence of Plasma on Structure.** — We now proceed to consider the influence of environment on the structure and functions of the ganglion-cell. And first as to the *plasmic* environment and its influence on structure. The proper evolution of the cell, *i.e.*, its proper growth both as to its discoverable and undiscoverable structure, and its proper union, by means of its processes, with other ganglion-cells, depend upon the nature of the plasma in which it is bathed. If, during the evolution of the nervous system, this plasma be for a long time imperfectly constituted, it is evident that the normal development of the ganglion-cells will be interfered with. This is what happens in rickets. During early life, when the evolution of all the tissues, and particularly of the nervous, is rapid, their component cells are bathed in imperfect plasma; hence their imperfect evolution, and on no tissue is the effect so disastrous as on the nervous. Compare the functions of a ganglion-cell with those of a gland-, muscle-, or any other cell, and you realize at once how much more serious is the imperfect development of the one than of the others. We have abundant evidence that the ner-

vous system is very seriously involved in rickets; all rickety children are highly nervous; laryngismus stridulus and tetany are practically confined to them, and they are moreover particularly liable to infantile convulsions. That this injurious impress on the nervous system is permanent is shown by the fact that these convulsions may develop, at a later period of life, into epilepsy. This statement I give on the authority of Gowers, who further shows that epilepsy may be traced back to rickets even when there have been no infantile convulsions. From these facts we may safely assume that an individual who has had rickets, even though he has not during childhood suffered from any obtrusive nervous symptom, is yet differently constituted—and that unfavourably—as to his nervous system from what he would have been had he not had rickets; and further, that this imperfect evolution of his nervous system is due to unhealthy blood-plasma.

The environing plasma may err both by defect and by excess: it may err, namely, by not containing in proper quantities the several substances essential to life, or by containing substances injurious to life: in either case the evolution of the ganglion-cell is interfered with. Prolonged starvation (=defect) necessarily prevents proper growth, and the influence of various poisons (=excess) engendered within the animal organism may be yet more fatal. So injurious indeed may be their action on the ganglionic cells that it will be well here to consider it at some length.

In the old days most diseases were attributed to poisons—or "humours," as they were then termed—

generated in and flying about the body, but with increased knowledge of physiology these crude ideas were necessarily much modified, with the result that medical thought ran into the other extreme, and their influence in setting up disease was for a time almost entirely lost sight of. Gradually, however, it began to be surmised that many of the symptoms of disease were caused by such poisons—that uræmia *e.g.*, might be due to the retention of nitrogenous sewage, and that the long train of symptoms peculiar to the typhoid state might be caused by the saturation of the tissues with poisonous matters; and recently the brilliant researches of Gautier have placed it beyond a doubt that poisons are being continually generated in the body, though they produce no evil effect during health, owing partly to their constant excretion with the urine, fæces, and sweat, and partly to their destruction (chiefly, perhaps, by means of the liver) within the body as they form. These poisons are strictly analogous to the vegetable alkaloids, (*e.g.* nicotine, morphine, atropine,) and they have therefore been named "animal alkaloids." They are of two kinds: *a*, the *ptomaines*, those produced during the disintegration (by means of ferments) of the albuminoid elements of dead tissues, a process which is continually occurring, during digestion, in the stomach and intestines; *b*, the *leucomaines*, those formed during the activities of living tissues.[1] Though innocuous in a normal state of the body, they are apt, under certain circumstances, to accu-

[1] For an admirable summary of our present knowledge of these bodies the reader is referred to Sir Wm. Aitken's work, "On the Animal Alkaloids." Edit. 2. London, 1889.

mulate unduly and with disastrous effect; they may be, *a*, produced in excess, as in dyspepsia; *b*, imperfectly destroyed by the liver (or other organ); *c*, imperfectly eliminated, as in constipation. The symptoms thus resulting will be best considered when we come to treat of the influence of plasma on function.

Meanwhile it is sufficient to point out that the plasma poisoned for years by these substances interferes with the due development of the ganglion-cells. I am, in fact, inclined to think that the imperfect evolution of the nervous system in the "rickety" patient is to be attributed more to the influence of such poisons on the nerve-ganglia than to mere starvation of them in consequence of an impoverished plasma.

Just as the evolution of a ganglion-cell (and therefore of the nerve centre of which it forms a part) may be interfered with by an improperly constituted plasma, so also may the structure of a perfectly evolved cell or centre be injuriously affected, *dissolution*, partial or complete, resulting. Let us take the case of a woman—and London affords examples of thousands such—who has sunk into an extremely nervous state through prolonged suckling, anxiety, over-work, under-feeding, and the breathing-in of foul air. The plasma is faulty both by excess and by defect—by excess in that it contains a number of poisonous, adventitious substances; by defect in that it does not contain the due amount of proper food-stuffs and of oxygen. In some instances there is no general loss of weight, owing to the production of fat so common in anæmia, but in the

worst cases we generally find the woman both emaciated and anæmic, and if we could weigh the different tissues of the body we should find those constituting the nervous system to have suffered less in this respect than any other soft tissue.[1] But such loss of weight as they do suffer has certainly a highly injurious effect, so that what with starvation and what with a vitiated plasma-supply during a long period, the higher centres undergo dissolution—there is an *undoing* of evolution. This is proved by a study of the highest nervous functions. There is failure in self-control, an exaggeration of the more ignoble emotions (*e.g.* anger, fear,) and many other functional changes pointing in the same direction. This dissolution involves, in the first place, what I have called the undiscoverable structure, but after a time the discoverable structure becomes affected, the cells perhaps altering in general outline or in the connection of their processes. Now it seems to be a fact that when a living organism has undergone change from its normal state, it tends, when placed amid its normal environment, to revert to the normal condition. Thus when the anæmic patient is well fed up, helped by tonics (especially

[1] The fact that in starvation the nervous system loses less in weight than any other tissue is, I suppose, connected with the fact that the tissues which constitute it are by far the most important. Every active cell in the body receives a nerve-twig, and therefore the body is practically made up of a nervous system, the efferent nerves of which have at their peripheries so many non-nervous cells. Viewed thus, the pre-eminent importance of the nervous system is apparent, and we see how necessary it is that, during the prolonged periods of starvation to which most animals in their natural state are from time to time subjected, its integrity should be preserved. I presume that its power to appropriate to itself the largest share of available food, or perhaps even to feed upon the rest of the body, has been acquired through natural selection.

iron), placed amid sanitary surroundings, and relieved from all distress of mind, the blood in most cases rapidly recovers itself; and the plasma environing the ganglion-cells being once again rich in food-stuffs and oxygen, and free, moreover, from poisonous matter, will in most cases permit those cells to revert to their normal state. Whether recovery is complete or partial will depend upon the extent to which dissolution has taken place; this may have proceeded so far that the cell can never completely recover itself, and in such cases the nervous system remains permanently injured.

Ganglion-cells are, it is well known, highly impressionable, and impressions, however slight, tend when once wrought upon them, to be perpetuated. This truth is exemplified by the ganglion-cells which subserve intellectual memory. When once these are agitated in a particular way they retain the power of recalling that particular agitation; there is left behind what has been termed "a residual state," which state consists in some change in the undiscoverable structure of the ganglion-cells. The forces that may cause the change are exceedingly subtle: a glance, a word, may be remembered for a lifetime; that is to say, the vibrations of the ether, the undulations of the atmosphere, are sufficient to bring about permanent ganglionic change. The higher nerve centres possess, more than any other tissues, this susceptibility of permanent impression by delicate forces, and this fact suggests that an injurious impression made upon the cortical grey matter itself must have a more abiding tendency than one made upon any other tissue. How far this is true of

influences that strike through the plasma I know not, but it certainly holds good of injurious influences operating through the cell processes, as I might show by citing some of the many evil habits of the nervous system.[1]

When once an individual has suffered from a functional nervous disorder he is much more liable than before to a subsequent attack: the centres implicated retain a memory of the disorder, that is to say, they retain the power of resuming the abnormal state peculiar to it.

2. **Influence of Plasma on Function.**—Having seen how abnormal plasma may lead to improper evolution and to dissolution of the ganglion-cell—the structure in either case being distinctly altered—let us now briefly consider the influence of the plasmic environment on ganglionic function as distinct from structure.

a. *Abnormally constituted Plasma.*—Peculiarities of blood-plasma are, it is well known, capable of causing serious perturbation of nervous function. The various chemical poisons, notably the ptomaines and leucomaines, afford good examples. These substances, as already mentioned, closely resemble many vegetable alkaloids, for example, atropine and morphine, in their influence on the nervous system. Who that has watched the delirium and coma of typhoid fever can fail to recognize their likeness to the symptoms produced by alkaloid poisoning?

That disordered digestion may exercise a peculiar

[1] See an interesting article on this subject by J. F. Goodhart, *Lancet*, vol. ii., 1889, p. 4.

influence upon the nervous system has been known from time immemorial. This is, in some instances, without doubt due in part to direct influence exerted by the digestive viscera upon the cortex, but there can be still less doubt that it is due chiefly to ptomainic poisoning.[1] The profound sleepiness which many dyspeptics complain of almost certainly arises from this cause. I have now under observation a patient who about half an hour after his meals begins to suffer from very distressing nervous depression which lasts two or three hours. This, I imagine, is due to ptomainic poisoning. It is interesting to remember in this connection that depression of spirits often comes on as the time for a meal approaches, and is removed by eating.

Murchison called attention to the fact that a vitiated blood may exercise an evil influence on the nervous system, setting up many and varied disturbances.[2] A certain condition of the blood resulting from disordered liver may, according to him, produce aching pains in the limbs, neuralgia, cramps, headache, vertigo, convulsions, tinnitus, sleeplessness, depression of the spirits, irritability, palpitation and other symptoms. These symptoms so common in the gouty, Ralfe connects with the accumulation of acid in the system. But whatever view we take of their causation it seems certain that they may often be removed by treatment directed to the liver.

A full appreciation of the fact that many forms of

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[1] See articles by L. Brunton, *Practitioner*, Oct. and Nov. 1880.

[2] Croonian Lectures "On Functional Derangements of the Liver," lecture ii. pt. 1, 1874. See also Ralfe, "On the Morbid Conditions of the Urine dependant upon Derangements of Digestion," p. 18. London, 1882.

nervousness may be the direct result of vitiated blood-plasma is most important. It brings out in bold relief the truth that the abnormal action of particular nerve centres may be due, not to any innate defect in them—a view which would perhaps most readily suggest itself—but to an abnormal stimulation of them through their environing plasma. It further impresses upon us the necessity of keeping the blood pure—the need that we should not only see that it shall contain those things which it ought, but that it shall not contain those things which it ought not.

It will be observed that I have endeavoured to keep distinct the influence of the plasma on the *structure* and the *function* of the ganglion-cell. We cannot, however, sharply distinguish between the structural and functional effects of poisons. When a poison is introduced into the blood of a perfectly healthy individual, we have no difficulty in tracing to the poisoned plasma the abnormal ganglionic action which ensues, the nervous centres being regarded as free from any structural weakness; but if the blood has been for a long time poisoned, as in chronic Bright's Disease, for instance, it is difficult to say how much of the abnormal action is due to the direct stimulation of the ganglionic cells by the abnormal plasma, and how much to actual ganglionic deterioration, resulting from the plasmic imperfection.[1]

[1] Even in cases of temporary functional alteration, produced by temporary plasmic vitiation, it is by no means always easy to be certain that the abnormal plasma has not produced some temporary alteration of undiscoverable structure in the ganglion-cells. *Vide* "Causation of Disease," part iii., chap. iii., by the Author.

b. *Abnormalities in plasmic pressure.*—Thus far we have considered only the *quality* of the plasma environing the ganglion-cells; no mention has been made of the *quantity* of it, nor of the *pressure*, which depends upon the quantity. This is determined by the capillary blood pressure, which again is regulated by the vaso-motor system and heart-action. That the pressure of the plasma environing the ganglion-cell exerts an influence upon the action of the cell is obvious. Fainting and convulsions are at times beyond all doubt caused by diminution in the pressure, and, in like manner, an increase in it leads to altered function. Nevertheless, the exact part which alterations in this pressure play in disease has not been determined, for the simple reason that we are generally completely in the dark as to the vaso-motor condition of the nervous system at any given time. Much has been written on congestion (active) of the brain and spinal cord, but the fact is that we know very little about this condition, owing to the said inability to gauge the vaso-motor state of the blood-vessels supplying the nervous system. It is very doubtful whether in such disorders as epilepsy and megrim (which are frequently attended by disordered vaso-motor action), the characteristic phenomena of the attacks are due to vaso-motor change, or whether the vaso-motor phenomena are secondary. The latter seems the more probable. Gowers points out that in epilepsy the condition of the vessels of the face and of the retina as to contraction and dilatation is by no means constant, and I can corroborate this remark as regards ordinary flushes. During both the epileptic fit and the

megrim the face may be either pallid or flushed, and the condition of the vessels of the face is no criterion of that of the retina. Each has therefore a separate vaso-motor system. Moreover, the vaso-motor state of the retina would appear to be no certain index of that of the brain. We cannot, therefore, tell what may be the condition of the cerebral vascular areas as to dilatation and contraction during an epileptic attack.

I think there can be little doubt that the vaso-motor disturbances met with in megrim are secondary also. In some cases there is arterial dilatation of the painful part; in others, constriction; in others, again, the action is irregular, the vessels being contracted in one part, dilated in another. Moreover, the condition of the vessels may vary with the attacks, the arteries being sometimes contracted, sometimes dilated. A like inconstancy of vaso-motor action presented itself in a patient of mine, the victim of severe anginoid attacks. These were at first accompanied by marked pallor, and afterwards by excessive redness of the face. (I saw her in one of the latter attacks.) Later on she suffered from each kind of attack on the same day, that in the morning attended by pallor, that in the evening by flushing.

But though such highly specialized disorders as epilepsy and megrim are probably not primarily due to vaso-motor irregularities, there is no doubt that irregular action of this system is capable of producing very unpleasant symptoms. In order that the nervous system shall carry on its functions aright, the blood-supply to its several parts must be regulated with great nicety; at one time a certain part

requires much blood, at another, a small quantity only, and we can understand how ill-regulation of the supply might lead to functional nervous disturbance. Nerve-tissue, like every other, requires rest in order to recoup itself, and that there shall be rest, the blood-supply to a part must be diminished; if, therefore, owing to erratic vaso-motor action, a part be for days together superabundantly supplied with blood, it will not be allowed to rest, and exhaustion will result.[1]

It is, I think, almost certain that some of the symptoms of nervousness are due to alteration in the pressure of the plasma environing the ganglia (this pressure being of course regulated by the vaso-motor system and heart) for the nervous are very liable to erratic vaso-motor action. We have already noticed that little is known about the symptoms referable to active congestion of the brain and spinal cord, because we seldom have any means of knowing the vaso-motor condition of these parts. Whether the condition known as plethora necessarily leads to increased pressure in the blood capillaries (and therefore in the extra-vascular plasma) I do not know: theoretically there is no reason why it should, seeing that a considerable quantity of fluid may be injected

[1] See on this subject A. Gamgee, F.R.S., *Practitioner*, Feb. 1877. It should be remembered that so far as glands, at all events, are concerned, an excessive supply of blood to them does not necessarily cause increased activity, as is proved by the well-known experiments on the sub-maxillary gland in which the chorda tympani is divided. Something more than an increase of blood-supply to a cell seems necessary in order to excite its proper functional activity; hence it may well be doubted whether a mere increase in the supply, continued for an unwonted period, is sufficient to cause its exhaustion. We may be quite sure, however, that long-continued hyperæmia will lead to functional disturbance of the cell.

into the vessels of an animal without altering the arterial pressure, or, presumably, the capillary pressure either,—owing to a compensatory arterial dilatation. It is certain, however, that plethora is frequently accompanied by distinct nervous symptoms which disappear after bleeding, foremost among these being giddiness, noises in the ears, and confusion of thought, all of which are very common in cases of sudden cessation of menstruation. They may also occur in plethoric men: I can recall two such instances. The first, already alluded to, is that of a florid, full-blooded man, who for many years has suffered a monthly loss of blood per rectum; just before the wonted period he experiences giddiness, confusion of thought and other nervous symptoms, all of which are removed by a copious flow. The other is that of a man of like habit who for some time had been experiencing very similar symptoms. One night, after a highly indigestible supper, he was attacked with great pain in the stomach and violent vomiting which led to a profuse hæmatemesis, after which his unpleasant symptoms almost entirely disappeared. I cite these cases because they seem to prove that an excessive quantity of blood may cause unpleasant symptoms, and also because I have heard good authorities maintain that a loss of blood is always to be deprecated.

We have now seen that the condition of the plasma exerts a marked influence upon the ganglion-cell, favouring or retarding its evolution, or, it may be, causing temporary functional irregularities, or actual dissolution.

Considering what a potent effect the plasma exerts on ganglionic evolution, it behoves us to be especially careful about its condition in all cases of nervousness occurring before maturity is attained, particularly when it is further remembered that the influence of a mal-environment for evil is great in proportion as it acts early in life. (See "Causation of Disease," page 135.) After a tissue has completely evolved, the cell environment, though still capable of working good or evil upon nervous structure, is much less effective than before complete evolution. (I do not of course allude to such serious forms of injurious environment as cause total and immediate dissolution.) Now the evolution of the nervous system extends much farther on into life than that of any other organ or tissue of the body: it does not cease when maturity is reached, the nerve centres retaining almost to the very end a high degree of plasticity, or power of being moulded for good or evil. Wherefore, even though the environment of pre-adult life may have been very imperfect, and proper evolution of the entire organism, including that of the nervous system, in consequence interfered with, we need not give up all hope of improving nerve-structure, but should exert the utmost effort to surround every ganglion cell with a plasma rich in the essentials of life and free from substances injurious to it.

The best means of effecting this we will deal with in a separate chapter.

CHAPTER III.

In the last chapter we dealt with the influence of the plasma on the ganglion-cells. In this and the following we shall consider how those structures may be still more deeply influenced by nervous impulses striking upon them through their processes. It is in this way the force stored up in the ganglion-cells —the nerve-dynamite as we may call it—is exploded or "discharged," *i.e.*, driven in the form of molecular vibrations along nervous channels to other ganglion-cells, or to muscle- or gland-cells, modifying their activity. The striking of a nerve ganglion-cell by a series of molecular vibrations (=nervous impulses) through one of its processes usually causes such a discharge, though it should be noted that it may have the very opposite effect, viz., may diminish the functional activity of the cell or inhibit it altogether, paralysis resulting. Every ganglion-cell is moreover supposed by some authorities to contain *within itself* the power of curbing its own activity—the power of self-control—and this control, whether inherent in the cell or exerted by another cell or other cells, is one of the highest functions of the nervous system. When it is wanting, the cortical ganglion-cells dis-

charge themselves wildly, as in epilepsy, and there is then heightened functional activity but of a degraded type: the cells discharge their energy inco-ordinately and inconsequently, much as young undisciplined troops, in the excitement of battle, rapidly exhaust their ammunition without effect for want of calculation of distance and steadiness of aim.

The directions which the molecular vibrations take as they escape along the efferent strands of a discharging ganglion-cell depend upon the connections peculiar to the cell. These connections are in their discoverable structure mainly determined by heredity, but the peculiarities of their undiscoverable structure are in a considerable degree acquired, for the ganglion-cell is highly plastic as regards the latter. There is probably nothing else in nature so plastic. A substance like clay or putty is readily moulded, but the moulding that such materials admit of is merely an external moulding, a moulding of visible form. A metallic substance also, in response to vibratory forces striking it from without, may be moulded, and still more intricately, an actual re-arrangement taking place in its internal structure; but in either of these instances the process is comparatively simple. It is far otherwise with the ganglion-cell; the moulding in its case is infinitely complex, and is effected in ways so delicate and subtle that while each new impress is retained, the previous impressions tend to remain unaffected.

Thus, when series after series of vibrations strike upon the ganglion-cell through its processes, its undiscoverable structure may be gradually altered. Each vibration influences this in such a manner that

it will more readily undergo the change a second time, and by the constant repetition of the same process the cell becomes at length more or less permanently modified, its molecular structure more and more complex, till, finally, the discoverable structure is modified also, the cell perhaps becoming larger and the ramifications of its processes more numerous than before. Who will doubt that the motor-ganglion-cells of Liszt were individually and collectively more structurally complex than those of a navvy having the same potentiality?

Education has essentially for its purpose the moulding of ganglion-cells. The process is both conscious and unconscious, but in either case the moulding forces are applied from without,—through the eye, the ear, the sense of touch; by such delicate forces as ether vibrations and sound vibrations are the ganglion-cells elaborated for good or for ill.

The training of the nervous system is a subject of great importance to the physician. If he can modify not only the invisible, but also the visible, structure of the ganglion-cell, it is manifest that he has at his command a valuable means of preventing disease.

No drug can strengthen or weaken the various connections between the ganglion-cells, but education can do this, and now that education is fast becoming —if it may not already claim to have become—a science, there is much hope that it may effectively help us in the cure of hereditary nervous weakness. Take, for instance, the immoderate blusher. Excessive tendency to blush, or what is practically much the same thing, excessive shyness, generally manifests

itself at an early age. Great shyness probably always goes along with the nervous diathesis; we observe it in those who show a liability to neuralgia, epilepsy, and even insanity. Whenever, therefore, it is very marked in a child, all the resources of education should be directed to combat it, to nip it in the bud, lest it develop into actual disease.

One of the great advances in modern education is that it recognizes that all are not cast in the same mould, and therefore cannot rationally be subjected to exactly the same kind of training; that what is suited to one is utterly unfitted to another, and that it is more than folly to submit all to one rigid, fixed mode of treatment—a true bed of Procrustes to the infinite varieties of human need and capacity. Thus the over-sensitive child, with a marked tendency to shyness, requires a peculiar care and watchfulness that would be wasted on, if not positively hurtful to, one of more robust nervous organization. To treat of this subject in detail would require more space than I can here give it. I will merely point out that by skilful treatment much may be done to strengthen a congenitally weak nervous system. Especially should the habit of introspection and the desire for solitude be discouraged. Children of all kinds benefit much by freely consorting with other children, but more particularly is this the case with those of nervous temperament, and for this reason school-life—provided always that the school is properly conducted—is generally the best life for them. The open criticism that obtains among a number of young persons, the badinage so freely levelled at any idiosyncrasy, the raillery that meets

all attempts at "moping," above all, the common interests, the common life which allows no single individual to be the special subject of attention, and thus counteracts the tendency to self-absorption, constitute a very wholesome influence and lead to a happy modification of many peculiarities of temperament, nervous or other, which the fostering care of home would be too gentle or too indulgent to correct. All such good results, however, presuppose careful and intelligent supervision on the part of those in authority, and the individuality of the child must never be lost sight of or disregarded. By the time a child is old enough to be sent to school its parents should have acquired at least a fairly accurate knowledge of its character, which knowledge should be made available for its future teachers, and these, if fitted for their calling, will know how to apply it in their own dealings with the child. Given these precautions, and I believe that nothing will be found so effectual as school-life to arrest any tendency to functional nervous disease in children.

The moral treatment of the adult blusher is much more difficult, seeing that in him the character is not forming, but formed. Here also every effort should be made to check the tendency to introspection and solitude. Doubtless much may be done for him by regulating his habits of thought and of life; but, unfortunately, he too often belongs to a hopelessly weak nervous type, inveterate blushers mostly coming from families showing a well-marked history of insanity and epilepsy. As a rule subjects of this kind show a decided nervous tendency from an early age; sometimes, however, an individual who has hitherto

enjoyed very good nervous health, and who has manifested no particular tendency to blush will, all of a sudden, under some serious perturbation of his nervous system, become exceedingly shy and reserved—much as an individual may be suddenly attacked with epilepsy or insanity. Many of these cases may be benefited or cured with proper care, and it is very necessary to take them in hand before they drift into hopeless chronicity and incurability.[1]

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[1] The following books may with advantage be consulted in connection with this chapter:—

Alexander Bain, "Education as a Science."
Herbert Spencer, "Education."
Th. Waitz, "Allgemeine Pädagogik."
B. Perez, "The First Three Years of Childhood."
D. A. Combe, "Principles of Physiology applied to the Preservation of Health, and to the Improvement of Physical and Mental Education."
F. E. Beneke, "Erziehungslehre," i. p. 181, *et seq.*
G. F. Pfisterer, "Pädagogische Psychologie."
Maria Edgeworth, "Practical Education."
W. Preyer, "Die Seele des Kindes."
John Locke, "Some Thoughts Concerning Education."
E. Thring, "Theory and Practice of Teaching."
Madame Necker, "L'Education."
J. Sully, "The Teachers' Handbook of Psychology."
C. Breun, "Education of the Nervous System."
J. Crichton Browne, Article in "The Book of Health."
Francis Warner, "Physical Expression." International Science Series.

CHAPTER IV.

Nervous Disorders caused Reflexly.—A ganglion-cell may discharge itself spontaneously. By this is meant that it may communicate vibrations down one or more of its processes independently of forces striking it through those processes, and also independently of any *specific* plasmic influence. It is possible, for instance, that the various ganglia that send down rhythmical impulses to the inspiratory muscles during ordinary breathing discharge themselves thus spontaneously, and if this is the case we must suppose that they are by nature so constituted that, when bathed in healthy plasma, there is inherent in them the power to set up a series of rhythmical changes. This unaided action of a centre is spoken of as automatism. Of course we cannot exclude the plasma from some share in the process, because the vital changes of protoplasm are really the outcome of the interchange of the protoplasm and its plasma; but in the case of true automatism there is nothing peculiar in the plasma to excite the nervous discharge, which is therefore essentially due to the constitution of the cell.

Possibly many of the ganglia which regulate the

functions of organic life possess this automatic power. It is doubtful, however, whether it resides in the higher ganglia in any considerable degree, if at all. The cortical ganglionic discharges, for instance, which occur during voluntary movements, take place in response to influences striking the ganglion-cells through their processes; the cortical ganglia may also be "discharged" by specific plasmic influences—by poisons circulating in the blood, the discharges thus excited taking, however, little or no part in the physical changes which underlie normal mentation. The automatic centres, though capable of spontaneous action, may be similarly affected either through their processes or by specific plasmic influences; for instance, the ganglia of the heart are capable of being influenced through the sympathetic or vagus, or by the direct action of poisoned plasma upon them.

Automatic ganglionic discharge is therefore limited in its range, and when or how a ganglion-cell shall discharge itself depends chiefly upon external influences in the shape of a peculiarly constituted plasma and of nervous impulses, the latter being the more important of the two. We must think of the various ganglion-cells of the body as forming together, by means of their processes, a complicated network; a continual stream of vibratory impulses strikes upon the cells through the intercommunicating network, and during its entire life-history a ganglion-cell is never once left wholly undisturbed by these vibrations. The faintest discharge in one ganglion-cell makes itself felt far and wide in others, but whether or not a vibratory impulse striking upon a

cell shall discharge it, depends, we may suppose, on two considerations: (1) the strength of the impulse; (2) the condition of the cell in respect of *a*, exhaustion, *b*, self-control, *c*, the presence or absence of inhibitory impulses striking it from without. *a*. When a cell is completely exhausted and its capacity for discharging itself has been used up, it will manifestly fail to respond to external nervous impulses, though slight exhaustion, by diminishing self-control, may increase the liability to discharge. *b*. Self-control being probably part of the normal function of the ganglion-cell, the latter may from the very first, through imperfection of undiscoverable structure, be deficient in it, and partial exhaustion, as just observed, may at any time diminish it. But from whatever cause the deficiency arises, it is obvious that a cell deficient in self-control will, other things being equal, respond more readily to nerve-impulses than one endowed with the normal amount of self-control. *c*. It is well known that a ganglion-cell may be inhibited by nervous impulses striking upon it in a particular way: thus it may happen that a nerve-impulse which would of itself under some circumstances discharge a nerve-cell, may under others fail to do so, *e.g.*, when some other impulse or impulses are striking upon the cell at the same time.

These remarks may be applied to all nerve-storms.

The phenomena of megrim and some other neuroses suggest that exhaustion of the implicated nerve-centres takes some part in cutting short the attacks. After an attack of megrim the patient may for some

time expose himself with impunity to what are usually exciting causes, but when the time for another attack recurs (*i.e.*, when—we may suppose—the nerve-centres have stored up force for a fresh discharge), no amount of precaution will ward it off; and the vibrations which are perpetually occurring throughout the ganglionic network will be quite sufficient to cause the explosion. (It should be noted, however, that some specific plasmic influence may precipitate the attack.) How large a part *b* and *c* play in the phenomena I will not stop here to speculate upon.

The principles just enunciated may be better illustrated by epilepsy. For convenience we will consider only the highest sensory and motor ganglia—those, namely, in which, according to Hughlings Jackson, the abnormal discharge begins (= "highest level" fits).

An epileptic may be regarded as one in whom certain ganglion-cells are, owing to inadequate self-control (resulting from imperfection of undiscoverable structure) or to some defect in inhibitory action from without, excessively liable to discharge. Let us suppose that the individual has not had a fit for some time, and that the period has arrived when he may expect another; and let us further suppose that he is suffering from an intestinal worm which has been causing serious local disturbance. As a result of the latter, impulses will ascend to the highest sensory cells which, not being exhausted by a recent attack and being moreover unstable in constitution, will discharge; and from them impulses will pass to the highest motor cells with a like result. Thus

there occurs a series of wild explosions in the highest cortical cells, and this is epilepsy.

The stronger the impulse striking upon a ganglion-cell, the greater is the tendency of the cell, other things being equal, to discharge. Supposing, therefore, a series of ganglion-cells to be, from some peculiarity of organization, liable to abnormal discharge, it is manifest that we should, as far as possible, protect them from impulses leading to such discharge. We can only in a minor degree control the impulses passing between one ganglion-cell and another, but we can to a very considerable extent control those passing up the several sensory systems. The sensory nerves are distributed to (practically) every tissue in the body, and therefore from every minute portion of the body-texture impulses are continually streaming upwards to strike upon the central ganglia. Now if, in an individual whose blood plasma is perfectly healthy, and who is moreover shielded from all local irritation, a series of ganglion-cells undergoes abnormal discharge, the neurosis may be spoken of as *spontaneous* or *idiopathic;* but if some local irritation of sensory nerves, by developing a series of irritating afferent impulses, leads to abnormal central discharge, it may be spoken of as *reflex*. In all such cases "the amount of peripheral irritation needful to call forth the abnormal central state is in inverse proportion to the abnormal tendency of the centre. The latter may, as it were, be so fully charged with dynamite that it will explode spontaneously: as when an asthmatic or epileptic fit occurs though every care be taken to prevent any peripheral irritation. On the other hand, the morbid tendency may

be so slight that a very intense peripheral irritation is requisite to bring out the morbid action."[1] This principle applies to every variety of nerve-storm.

Opinions differ as to the importance of peripheral irritation in the production of nerve-storms. Brown-Séquard first directed attention to the subject. "I will show," he says, "by an immense number of recorded cases, that insanity in its various forms, epilepsy, chorea, catalepsy, ecstasy, hydrophobia, hysteria, and all the varieties of nervous complaints, may be the result of a simple, often very slightly felt, irritation of some centripetal nerve."[2] There can be little doubt that this author has exaggerated the influence of peripheral irritation in the production of the several neuroses, and has not taken sufficient account of the *central weakness;* but on the other hand, I cannot but think that in recent times the influence of peripheral irritation has been underrated. Gowers in his classical work on epilepsy practically ignores it as an exciting cause of the epileptic fit, and similarly, Anstie, in his admirable work on neuralgia, is at great pains to show that the essential cause of this disorder lies in the centres implicated.

While agreeing with the last-named writers in regarding central weakness as by far the most potent factor in the production of the various neuroses, I am nevertheless convinced that peripheral irritation also plays a very decided part. Medical literature

[1] See "The Causation of Disease," London, 1889, p. 169. By the Author.

[2] "Lectures on the Physiology and Pathology of the Central Nervous System," by C. E. Brown-Séquard, M.D., F.R.S., Philadelphia, 1860, p. 166.

abounds in cases illustrating this fact, and although many of these are fanciful, (especially those which have been recorded by the gynæcologists,) many are genuine instances of reflex disorders. From the numberless recorded cases of reflex neurosis I select the following :—

"*Case* —. A lad *æt.* 12 had a fatty tumour on the right side of the neck. If this swelling were gently touched by the finger, *or even by a feather*, he instantly lost consciousness and was thrown into a most violent tetanic spasm. . . . . Mr. Holden subsequently removed the tumour and all his various symptoms ceased."[1]

In the light of such a case as this,—and there are many strictly authentic cases equally remarkable,—who shall say that reflex irritation takes no share in the causation of a neurosis seemingly the most spontaneous ? Many sources of reflex irritation lie beyond the reach of investigation, and I contend that in all cases of central functional nerve disturbance, we should carefully seek for a local source : even if such irritation take no part in exciting the disorder, it may help to sustain, or to aggravate, it when induced.

The irritating impulses may start in any part of the body containing sensory nerves — that is, *in practically all parts.* A large number of peripheral expansions are, as just now hinted, beyond the reach of investigation, but the following sensory regions admit of more or less thorough examination, and their condition should be studied with the utmost care. Under each of the more important headings I have noted the principal sources of irritation.

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[1] "Diseases of the Nervous System," by Samuel Wilks, M.D., p. 387.

The eyes . .	Errors of refraction.
The ears . .	Impacted cerumen.
The nose . .	Affections of the nasal mucous membrane (catarrh, polypi); deflected septum.
The throat.	
The larynx.	
The heart and lungs.	
The stomach .	The various forms of dyspepsia.
The intestines .	Ditto; intestinal parasites.
The rectum .	Hæmorrhoids; fissure; ascarides.
The generative organs . .	Internal —. External — too long prepuce; pruritus [rubræ.
The urinary system . .	Calculus.
The scalp . .	Pediculi.
The skin . .	Pediculi; eruptions; tumours pressing on nerves.

It is a good plan to have all the above sources of irritation in mind when a case of nervousness comes before us. To make a detailed examination of each region indicated would be a laborious proceeding, and is fortunately seldom necessary; but the possibility of local irritation in any one of them should ever be before us, and I am convinced that the more thorough our examination, the more likely is our treatment to be successful; and that the most accomplished physician, unless well alive to the possibility of some peripheral irritation, will very frequently overlook some important hints as to treatment.

At the same time we have to be careful not to attribute too great an influence to irritation in any *one* region. This is one of the dangers of specialism. The specialist is apt to think that every disorder for which a patient consults him has its origin directly or indirectly in that organ which he makes his special study: the throat specialist thinks to find it in the

throat; the aurist in the ear; the gynæcologist in the generative organs. Nor can we wonder, for the specialist, who is also often an exclusivist, soon learns to forget or to think very lightly of diseases outside his own particular province; those pertaining to his narrow speciality make up his whole clinical and pathological world, and thus he regards every symptom of which his patient complains from an altogether one-sided point of view. And the more exclusive the specialist, the more of course is he biased in this way. Thus the gynæcologist is the most exclusive of all practitioners; for him, "l'utérus, c'est la femme"; the eye-surgeon, on the other hand, who is for the most part a general surgeon as well, more readily recognizes the fact that the subject of his special study forms but a small part of a vast and complex organism. Yet who shall say that in the production of neuroses the eye plays a part altogether insignificant as compared with that of the uterus and ovaries?

That he may avoid shipwreck on this rock let the physician acquire a sound practical knowledge of each speciality. If half the time at hospital that is devoted to the acquisition of theoretical and only very indirectly useful knowledge, were spent in the study of special diseases, we should turn out men much better equipped for their work, and at the same time strike at an ever-increasing danger. Why should not the "first-year's student" proceed at once to study the diseases of the eye, ear, throat, nose, and skin? He might make considerable advance in all these specialities without any profound knowledge of anatomy or physiology; and he would come to the study of the

anatomy and functions of these organs with a zest and interest which are often wanting.

The above table is very imperfect. I have only indicated a small number of those disorders of the various sensory peripheries which may reflexly call forth central disturbance, and I have moreover made no mention of the special nervous disorders which may be thus excited. It must be noted, however, that irritation of a particular sensory expansion tends to call forth its own peculiar train of phenomena. Thus irritation of the ophthalmic nervous system (notably that which is induced by errors of refraction) is one of the commonest causes, perhaps the commonest cause, of frontal headache, and a very frequent cause of megrim; disease of the nasal cavities is a fruitful source of asthma, "muddle-headedness," headache, and inability to fix the attention.[1] Similarly, impacted cerumen in the external auditory meatus is apt to induce its own characteristic symptoms.

It is not my intention to consider here the various trains of symptoms which are more or less peculiar to irritation of the several peripheral expansions, as this would require a large space, but it is necessary to make special mention of disorders of the internal generative organs in the female as reflex excitants of nervous disturbance. The sensory nerves which have their origin in these organs probably take a large share in generating the emotions. Hence disorders of them are apt to exercise a marked influence over the emotional being, and may thus play some

[1] See interesting papers on this subject by Dr. Guye and William Hill, M.D., B.Sc., *British Med. Journal*, p. 709 *et seq.*, 1889. My experience fully bears out the main conclusions at which these authors arrive.

part in inducing the hysteric state. Indeed, it is possible that irritation of this particular expansion is more calculated to excite hysteria than that of any other; the most terrible uterine and ovarian diseases may, on the other hand, exist without any nervous disturbance whatever, and it is the experience of most reliable physicians that the functional nervous disturbances in women are generally best treated by attacking the central nervous system directly. Of the various sexual disorders helping to cause nervous disturbance, menstrual irregularities are, in my view, by far the most important; they practically never occur without it, and although the disturbance may be in some cases the cause of the irregularities, there can be little doubt that it is frequently the result. The influence of uterine displacements and abrasions, etc., of the cervix in provoking nervous disturbance has, as J. Matthews Duncan has so vigorously insisted, been grossly exaggerated.

In seeking for a cause of nervous disorders in the internal genitalia we should above all be careful lest by implanting in the patient's mind the belief that all her sufferings have a local cause, we establish a new cause of trouble instead of removing an old one. For, once such a belief has become rooted in the mind of a nervously disposed woman, it may follow her to the grave, and she will ascribe all her pains and aches to a disorder which has no existence except in the imagination.

CHAPTER V.

The publication of Weir Mitchell's work on "Fat and Blood" may be said to mark an era in curative medicine. Although before its publication the importance of improving the nutrition of the anæmic and emaciated neurotic had been tacitly acknowledged, and treatment already directed to this end with greater or less success, yet it may safely be said that till its appearance no physician had sufficiently insisted upon the vital necessity of influencing the quality of the blood and the general nutrition of the body, and certainly no one had devised a method of attaining these results so systematic and effectual as his. Attention had, instead, been futilely directed to the treatment, by drugs, of what were merely symptoms, the evil remaining totally unarrested at its source.

We find among the nervous all degrees of malnutrition, from scarcely perceptible anæmia or loss of weight, to such utter starvation of the body that the wonder is how life can any longer continue. We saw that the undiscoverable structure of the nerve ganglia may be affected through the blood-plasma; directly the latter becomes impoverished the undiscoverable structure tends to undergo dissolution, and

symptoms of nervousness develop, the rate and depth of the dissolution, the intensity with which the symptoms consequent on such dissolution appear, and the rate of their appearance depending upon the innate hardiness—so to speak—of the ganglionic structure. Clearly, then, the only rational plan of treatment in such cases is that which aims at enriching the impoverished plasma, "filling the vessels with red blood," and bringing the body weight up to the normal standard. Specific drugs and other remedies may check for a time the urgency of the symptoms, but in the more serious cases we cannot reckon upon a permanent cure until the blood and the tissues generally have regained their wonted condition.

The method of achieving these ends differs in different cases. In the slighter degrees of mal-nutrition, such as result from overwork or improper diet, tonics and a careful regimen may suffice; in more serious cases rest and change of air and scene may be needed. Often, however, the mal-nutrition is of too long standing, the dissolution too profound, to be remedied in any of these ways. The exhausted nerve-centres require absolute repose, and to ensure this it becomes necessary to send the patient to bed. This done, it often happens that, notwithstanding the seriousness of his condition, simple rest aided by suitable and regularly administered diet will suffice to restore him to health without any further measures. How many patients who come into hospital quickly recover under this treatment,—patients who present a series of anomalous symptoms,

and to whose disorders it is frequently impossible to give names; who, in fact, need only rest and good food! Many cases of nervousness may be cured in this simple way. Quite recently I heard of an English lady who while engaged as a governess on the Continent had sunk into an extremely nervous state, and not wishing to consult a "foreign doctor" resolved to take her own case in hand. Having heard of the Weir Mitchell treatment, she determined to try it so far, at least, as rest and ample feeding were concerned. She accordingly went to bed for a fortnight, and at the end of that time regarded herself as cured.

In the most serious cases, however, it is necessary to adopt the Weir Mitchell treatment in its entirety, —including, as it does, isolation, massage, electricity, and feeding up. Thus, just as there are grades of nervousness so are there grades of treatment, and one of our chief difficulties is to determine to which the patient shall be subjected. It is not correct to suppose that he has no alternative between undergoing the treatment in its full rigour, and being simply treated by tonics, rest from work, or change of scene. The opinion is, I believe, rather prevalent that the Weir Mitchell treatment carried out in full detail is only suited to the chronic, bed-ridden and emaciated hysteric; but although this kind of case is the field in which its most brilliant results are achieved, yet it will also often cure other forms of emaciation and nervousness not due to organic disease. The following case bears out this statement:—

Æt. 33 (man). Sensible and intellectual, with no organic disease, but very nervous; height, 5 feet 11 inches; weight, three years ago, over 12 stone, now only 9 stone 2 lb. His illness began with dyspepsia for which he consulted doctor after doctor in America and England and underwent many different forms of treatment, but always without successful result. One treatment required him to draw off the contents of the stomach four hours after each meal, with the object of ascertaining what had not been digested by that time, that it might be avoided in future! In this way his dietary was curtailed of one article after another till only two or three were left. As might be expected he grew thin and anæmic, and dissolution of undiscoverable ganglionic structure evidently began. He became intensely self-centred—and what wonder—and so prostrate that the slightest exertion, even the mere effort to think, exhausted him. A long train of nervous phenomena now set in, the most marked being mental, as is generally the case where a mind naturally vigorous and of high order becomes disorganized. The social instincts (latest to be evolved and therefore first to go) having completely vanished, all the powers of a gifted and cultured intellect were turned inwards in self-contemplation in spite of the strongest efforts of will. In this state of intense anæmia, emaciation, and confirmed hypochondria, and after he had visited various watering-places at home and abroad without benefit, I first saw him. Now I protest against pooh-poohing the "whims" of such a patient; it is sheer nonsense to tell a man in this condition that there is nothing really the matter with him, that it is all his "fancy," and that if he will only think less of himself and more of others he will get well. No one could more thoroughly realize and deplore his own moral disintegration than did this patient, yet while he deplored it, he was quite incapable of freeing himself, by any effort of will, from the net of morbid feelings and fancies in which he had become entangled. The nerve-centres were far too exhausted to allow of any such effort, and no abatement in his nervousness was possible until their undiscoverable structure had been built up again by an enriched plasma. Clearly here was a case for determined treatment under direct supervision. I accordingly ordered him to bed, and seeing that no half-measures would avail, I put the Weir Mitchell method in full force. After a few days he was placed upon the superabundant diet, and massage was administered. He is now rapidly putting on flesh, and is fast recovering his normal tone of mind.

It is not within the scope of a book like the present to describe in detail the various methods of enriching an impoverished blood and of improving the nutrition of the body: my object is simply to press home the fact that in all cases of nervousness in which there is anæmia or in which the patient is below his normal weight, our great aim should be to "fill the arteries with red blood" and raise the body weight to the normal level, drugs being only useful as adjuncts to our treatment. We can always, practically, succeed in this when there is no organic disease. The most hopeful subject is, of course, the ill-nourished neurotic, for obviously in his case improved nutrition will lead to improvement in his nervous condition; when the patient suffers from nervousness in spite of good nutrition, his case is more serious; the root of the evil lies deeper, and has to be reached by other methods. But even then he should be very careful to take his food regularly. Regularity in meal-times is desirable for all, but doubly so for the neurotic, by whom fasting is ill-tolerated even in health. "Epileptics," writes Dr. Liveing, in his classical work on megrim, "so far as my experience goes, bear abstinence ill, and I have often been surprised at the rapid way in which they become faint if they are kept waiting beyond the time of their accustomed meals." He also notices that Galen observed this more than 1700 years ago. I believe, however, that not only the epileptic, but all who are nervously disposed can ill endure long fasts: their nerve-centres cannot bear even a temporary starvation. Thus I have frequently observed mental depression as well as faintness result from

long abstinence on the part of such, both symptoms at once disappearing on the taking of food. Of course depression often occurs in the nervously disposed after food also, but the cause in this case is ptomainic poisoning of the nerve-centres resulting from some form of indigestion.

CHAPTER VI.

Outdoor Exercise.—All physicians are agreed as to the advantage of outdoor exercise in almost every disease which is not acute, and in no case is it more beneficial than in functional disorder of the nervous system. There is indeed no nerve-tonic to be compared in efficacy to fresh air. Thus Liveing insists upon its importance in the treatment of megrim, Salter, of asthma, and R. Reynolds, of epilepsy. As might be expected, therefore, outdoor exercise is highly beneficial to the habitual blusher; it improves the general health, exerts a favourable influence upon the vaso-motor system, and, by removing the unnatural pallor so common in those who spend the greater part of their lives indoors, renders the blush, when it does occur, less remarkable. The beneficial effect of outdoor exercise on the nervous is easily explained. Man is by his origin adapted to an outdoor life; his natural home is the open; he has evolved from the lowly amphibian not as a sedentary creature confined within four walls, but as an active being living under the free canopy of heaven. Hence the open air is his normal environment and he is never so healthy as when he is constantly in it. I have elsewhere argued

that all diseases are natural variations, that they are for the most part of recent ancestral origin, and that recently acquired characters are very unstable, very apt to disappear. When therefore an individual is suffering from any given disease we may compare him to a plant which has recently been made to vary in a particular way. Now, placing such a plant in its pristine environment generally causes it to revert to its pristine condition—to throw off those characters which have been impressed upon it by artificial conditions. And in like manner an individual who is afflicted with disease (=a pathological variation) tends, when placed in that environment which may be regarded as his natural one, to throw off his recently acquired characters and to revert to the *status quo ante*, *i.e.*, health.[1]

Excessive open-air exercise, or, in fact, any violent muscular exertion, has, however, in the case of the nervous, to be guarded against, and it is sometimes necessary to prohibit it entirely, as, for instance, in the case of the highly anæmic and emaciated neurotic who needs rest before all things. In this connection I may call attention to a curious fact which I have often noticed; viz., that mental and physical fatigue do not always go hand in hand. I have seen persons physically worn out and prostrate after a long spell of overwork, mental and bodily, yet still capable of close mental application; indeed, I am acquainted with a lady whose intellectual faculties, far from being blunted, are actually

[1] This subject is worked out at length in "The Causation of Disease," chap. xi. pt. i.

sharpened under pressure of excessive work, and this in spite of severe headache. In her case over-action does not express itself, as it should, by a sense of mental incapacity for the time being, but rather by increased mental activity. Persons of this type run great danger of doing themselves grave injury; did the incapacity for further mental effort make itself felt as soon as the sense of fatigue, they would leave their work perforce ere it passes physiological limits; as it is, they are tempted, if it is urgent or engrossing, to disregard the feeling of fatigue (which, like other pains, should serve as a warning) and to subject themselves to a mental overstrain which others, differently constituted, escape.

In regard to the influence of rest, many patients have told me that, when the flushes come on, they derive great relief from lying down.

Regularity in respect of food, rest and exercise is an invaluable means of securing and maintaining health. I am convinced, to take an example, that ninety-nine hundredths of the delicate children among the well-to-do are not delicate by virtue of any innate weakness, but in consequence of an irrational system of bringing up, which instead of insisting upon regularity in diet, hours, and the like, lets all be subject to caprice, sometimes of the parent, more often of the child itself. Children are very seldom innately weak; this truth might be arrived at *a priori*, as I have elsewhere shown, and it can be proved *a posteriori* by any one who will take the trouble to follow carefully the circumstances of a child's career. It will practically always be found that it is the system of

up-bringing, not the child, which is at fault. I illustrate the importance of regular living by reference to the child, partly because I have recently been much impressed by it myself, and partly because in his case the ill-effects of irregularity can be readily seen. But what is true of the child is obviously true also of the adult. I need scarcely allude to the irregular system of diet which obtains among the lower classes, especially among the women, and to the evils it entails. Having to prepare their own food and being often enough worn out by the work and anxiety consequent on large families, they are apt to neglect their proper, regular meals, and thus drift, unknown to themselves, into chronic dyspepsia and so into actual starvation. Many more are, I believe, starved in this way than from absolute want.

Digestion.—We have seen that flushes are often secondary to dyspepsia; we should therefore be very careful to look to the digestion in all cases of flushing. In fact, this function should command close attention in all forms of nervousness, seeing that disorders of it are apt to lead to vitiation of the blood, and consequently to disturbance in normal nervous function. This vitiation may be caused by the undue accumulation of poisonous ptomaines, or by inefficiency in those structures whose office it is to render them inert. There seems little doubt that the liver plays an important part in this respect: and we should therefore be on the alert to detect any disorder there. When such is discovered the following mixture may frequently be given with great advantage for several mornings in succession

on rising, especially to plethoric women at the climacteric.[1]

Am. Chlor., gr. x.
Ext. Tarax. Liq., ℥ss.
Decoct. Aloes co., } āā ℥v.
Inf. Gent. co., }
Sodæ Pot. Tart., } āā ℥j.
Tinct. Lavand. co., }

If the liver is not sufficiently active, another dose should be taken in the middle of the day; if too active, it should be taken every other, or every third, day. Or we may substitute for this medicine the old-fashioned remedy of a blue pill taken at night and a dose of salts in the morning. There is no need, however, to enter here any further into the treatment of dyspepsia. I merely wish to insist upon the very great importance of looking into the state of the digestive organs in all forms of nervousness.

The Skin.—Great attention should be paid to the skin. The best way of acting upon this tissue is undoubtedly by bathing and by free bodily exercise. Many nervous symptoms are caused by the stimulation of nerve-centres by certain effete matters, and we should therefore—to remove these—direct our efforts to raising the excreting power of the several emunctories to their full capacity. A due amount of bodily exercise, daily hot baths, and soaping the entire surface of the body, as recommended by Sir Erasmus Wilson, are the best means of getting the skin to act vigorously. The alkali of the soap unites

[1] See Article by Corfe in *Medical Times and Gazette*, "On Uterine Disturbances in Relation to the Climacteric Period," April 7, 1849.

with the fatty acids[1] so abundantly present upon the surface of the skin, and in this way the organic excreta are easily got rid of. There can be little doubt that by the use of soap the excretory action of the skin is increased.

When the skin is abnormally dry, its action is best promoted by means of Turkish baths, or we may give acetate of ammonia or other sudorifics. According to Tilt[2] a flush is relieved by perspiration; therefore he argues that in all dry flushes we should get the skin to act. In some of my cases, however, the symptoms were most distressing just at the very time that perspiration occurred. Moreover, it does not follow that, because the flushes are dry, the excretion of the skin is upon the whole defective, for the patient may perspire abundantly when not flushing. It is only, therefore, when the quantity of perspiration in the twenty-four hours is decidedly below the normal that we need recommend Turkish baths or sudorifics. Defective or excessive excretion by both the sudorific and the sebaceous glands is not uncommon among the nervous, and is manifestly the result of faulty nervous action. Excessive secretion of sebum is less frequently observed than excessive perspiration; I have, however, noticed it. Thus a patient after a nervous seizure became "oily all over." It is as a rule best not to give any special drug to diminish excessive perspiration in the cases we are considering.

Baths.—By means of baths we are able to act

[1] These are apparently not excreted as such, but are the result of secondary decomposition.

[2] See *op. cit.*, p. 102.

directly upon the vaso-motor system, so susceptible in nervous patients, and at the same time to improve the general health.

a. *Cold Baths.*—Cold baths cause contraction of the cutaneous arterioles. After the bath these dilate, and there is then a glow over the entire surface of the skin and a general sense of exhilaration. Sometimes, however, dilatation occurs too soon—*i.e.*, in the bath; or the vessels may not contract at all, dilatation continuing during and after immersion. On the other hand, the contraction caused by the bath may continue for some time after it. In any of these cases the cold bath is injurious. Some persons can never be got to tolerate it. Take, as an extreme case, an individual afflicted with well-developed Raynaud's disease, when even a blast of cold air may suffice to cause fatal contraction. In others, the morbid tendency is less developed; it may, in fact, be so slight that we find it difficult to decide whether the case is one of genuine Raynaud's disease or not, and the individuals may pass through life without being regarded as the victims of any complaint. They merely notice that they are very susceptible to cold, and that they cannot take cold baths like other persons. In such instances we have examples of health so imperceptibly shading off into disease that we cannot say where the one ends and the other begins.[1]

[1] This may occur in the case of practically any disease, and is not sufficiently recognized; nay, it is scarcely recognized at all. The only author who has touched upon the subject, so far as I know, is J. Hutchinson, in his recent oration on the "Clinical Uses of Rare Diseases." Do we not too dogmatically assert that an individual either has or has not epilepsy, hæmophilia, paralysis agitans, &c., oblivious of the fact that in each of

While, however, there are some who can never be got to tolerate cold bathing there are many who, though very susceptible to the influence of cold, can yet be trained to it. The bath should at first be tepid, and its temperature should then be gradually lowered from day to day. Its duration should vary with the temperature. Thus a comparatively long immersion in tepid water is to some extent the equivalent of a momentary plunge into cold. Making due allowance for this consideration the duration of the bath should be gradually increased, but with this precaution, that it should never last more than a few seconds in winter. A little warm water may be added in very severe weather to take off the chill; but, as a rule, it is best not to raise the temperature when once the patient is able to take the genuine cold plunge. The beneficial effect of such a bath is due to the fact that its temperature equalling that of the atmosphere at the time, the cutaneous vessels are made to contract to a degree equal to, or greater than, that which the atmospheric temperature of the time is capable of causing. During menstruation the bath should be taken tepid

these perfect health imperceptibly shades off into the fully developed and unmistakable disease? Were disease a material entity, did it consist of a something which might be cut out of, or distilled from the body, we might be thus dogmatic in our diagnosis; we might say either the entity is in the body, or it is not in the body. But this crude conception of disease is clearly erroneous. Disease is morbid function, morbid vital action, an improper interaction between the organism and its environment, and thus there being every conceivable grade between perfect and imperfect interaction, it is obviously impossible to draw a sharp dividing line between the one and the other—between absolute health and unmistakable disease. Pathologists, moreover, blind to the fundamental truths of biology, are still too much inclined to regard diseases as more or less fixed and unchanging types; whereas it would perhaps be correct to say that the diseases which cannot be named are more numerous than those that can.

(the temperature being afterwards gradually lowered again) or it should be discontinued. The beneficial effects of cold water may be heightened, and any injurious effects it may have minimized, by adding to it certain substances. It is now known that the various mineral waters do not, when used for baths, exercise *specific* effects, all the various salts having but one and the same action. But water containing a certain per-centage of salts stimulates the skin more readily than distilled water, and therefore common salt may with advantage be added—say, in the proportions of ten pounds to fifty gallons. Such an addition will be found beneficial in every case, and it or some equivalent should always be recommended for those patients whose skin does not properly respond to cold. Even more beneficial than salt baths for such patients are baths containing turpentine. These were recommended by Tyler Smith, but seem to have fallen into desuetude. The following may be added to a bath of fifty gallons :—

Common Soda . . .	2 lbs.
Oil of Turpentine . .	2 pints.
Oil of Rosemary . .	half an ounce.

Tyler Smith observes that in the coldest day in winter such a bath may be employed with the greatest safety. "A sense of calmness and tranquillity very frequently follows a previously disturbed, irregular, or excited condition of blood," and the skin becomes "velvety and soft."

After the bath the skin should be rubbed vigorously with a rough towel, or better still—when it is fairly dry—with the *warm*, *bare* hand. This should

be continued until the whole surface glows. The patient should never feel cold after the bath.

There are, I find, very few, excepting of course those afflicted with some serious organic disorder, or those showing a decided tendency to Raynaud's disease, who cannot by some such graduated system as I have indicated be got to bear cold water baths. I have myself never seen any evil result from their use with the precautions above mentioned, and I even recommend them up till the last days of pregnancy. Unfortunately, one has often a deep-rooted prejudice to fight against.

By a course of cold baths, the vessels of the skin become gradually accustomed to respond readily to external cold, and the patient is thus much less apt to "catch cold" from sudden chill. It is possible also that the vaso-motor centres are in this way so influenced that they become less liable to the many varieties of erratic explosion common in the nervous. More probably, however, the beneficial effect of cold bathing in these cases is due to the improvement in general health which almost invariably follows upon their use.

b. *Tepid Baths* exert a sedative effect upon the nervous system. Highly nervous patients may sometimes derive considerable benefit from remaining for two or three hours in a bath in which the water is from 93°–94° F. In this way a large surface of skin with its vast expanse of sensory nerve-endings is brought under the sedative influence of the tepid water.

c. *Hot Baths.*—It is scarcely necessary to insist

upon the advantage of hot baths to nervous patients. The cold bath in the morning may frequently be combined with the warm bath in the evening, when the entire surface of the body should be lathered with soap. A warm bath sometimes relieves in a remarkable way the aches and pains so common in nervous women, especially at the climacteric, and it is one of the best hypnotics we possess. Hot mustard foot-baths are useful for cold feet.

d. *Turkish Baths* are chiefly useful as a means of inducing sweating. The habitual frequenter of Turkish baths knows by experience how long he should remain in the several rooms; if the patient has never been in a Turkish bath before, he should be cautioned to spend some time in the coolest chamber.

Bleeding.—Bleeding often does great good when the subject of flushing is plethoric, but when thin and anæmic, it is obviously harmful. During the first months, or even years, after entire cessation, and during the long intervals of complete amenorrhœa which are apt to occur at the change of life, the woman is apt to become plethoric, and to suffer in consequence from flushes and other nervous phenomena. The latter are chiefly referable to the head: *e.g.*, giddiness, a sense of fulness, and other anomalous sensations. The patient moreover suffers from great mental irritability: she is apt to start at the slightest noise, to be irritable with her children, despondent, and ready to burst out crying on trifling provocation, or, indeed, without any provo-

cation whatever. All these symptoms are met with at the climacteric, whether the woman be full-blooded or not; indeed, they may be present in the intensely anæmic and emaciated, but they—and especially the excessive mental irritability—are peculiarly apt to occur in those plethoric women who have not been relieved by a free menstrual flow. Such are beyond all doubt benefited by bleeding. W. Tyler Smith was an ardent advocate of bleeding in certain cases at the climacteric; he observes that the effect is often marvellous.[1] How the depletion does good it is difficult to say. It is now known that the withdrawal of blood, except in dangerous quantities, does not permanently decrease the blood-pressure, owing to a compensatory vaso-motor constriction, and to a rapid absorption of fluid from the tissues. The effect of the latter process is to diminish the specific gravity of the blood, the plasma becoming more watery, and the number of the blood-corpuscles less, and possibly it is to this lessening of the specific gravity that the good results which follow from bleeding in the class of cases described are due.

The plethoric generally bear bleeding well, but it must be remembered that individuals differ in this respect, apart altogether from their condition of full-bloodedness or anæmia. The loss of a single ounce of blood may in one individual cause faintness, while another will lose sixty or seventy ounces without inconvenience.

The blood may be drawn by means of the lancet or of leeches. In the former case the operation

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[1] *London Medical Journal*, July, 1849, p. 601.

should be performed with the patient in a sitting posture so that any sign of faintness may be at once detected.[1] Patients, however, generally object to the lancet.

Leeches may be applied to almost any part of the body. The best situations are: *a.* Behind the ears. This is perhaps the best situation when the head symptoms are pronounced, as possibly the brain may be more directly affected by the removal of blood from this part than from a more remote one. *b.* The cervix uteri. It seems rational to draw off blood from this part when the plethora is due to defective menstruation; but some authors contend that it is unwise to attract blood towards the uterus at a time when the internal generative organs are undergoing involution. There is some difficulty in applying leeches to the cervix, but this difficulty may be overcome by employing an instrument devised for this purpose by W. Clegg.[2] *c.* The groin. This is in the cases under consideration probably the best situation, for the blood lost from here comes from a vascular area very closely related to the uterine area, and yet quite separate from it. It is moreover the least unpleasant position. *d.* The anus.

After the application the patient may be placed

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[1] Bleeding is so seldom performed now-a-days, that it is perhaps advisable to briefly describe the operation here. It is most convenient to bleed from the arm. This should be compressed above the elbow. The patient then grasps some firm object in the corresponding hand, and is directed to make occasional pressure upon it, so that by bringing the muscles of the arm into action, the flow of venous blood may be facilitated, and the operator then opens the largest superficial vein at the elbow—generally the median basilic. The incision should be longitudinal or slightly oblique. After the requisite quantity of blood has been lost, the part is bandaged.

[2] *Medical Times*, June 2, 1849, p. 604.

in a warm bath; in this way it is said that much blood may be lost without producing exhaustion. I have never recommended this plan myself, not because I doubt its efficacy, but because the loss of blood in this way must necessarily be a highly disagreeable experience to the patient.

When the patient will not submit to the withdrawal of blood by either method, we must rely entirely upon the effects of exercise, moderation in diet, increase of cutaneous action, and the use of hydragogue purgatives. In marked plethora, however, no treatment is so efficacious as bleeding.

Electricity.—It seems to be pretty generally recognized that electricity may be employed with great advantage in many forms of nervousness. Cases of flushing and blushing are occasionally benefitted by it; but whether the good effects are simply due to the improvement in general health brought about by its means, or to a more direct action on the vaso-motor system, it is difficult to say—probably the former, seeing that the storm is in all probability not primarily vaso-motor in origin. Obviously, if we want to get at the vaso-motor nerves of the face, we must attack the cervical sympathetic, which supplies the entire head (including the brain and neck) with vaso-motor nerves. The galvanic current is preferable; one electrode should be placed at the nape of the neck, the other behind the ear, and the latter should be drawn up and down the line of the sterno-mastoid muscle. It should be remembered, however, that the sympathetic is deep-seated, and it is therefore doubtful whether it is in

this way stimulated in any appreciable degree. It is also doubtful whether much benefit accrues from attacking the vaso-motor nerves, seeing that nerve-centres—not nerves—are the great regulators of vaso-motor action. In some cases, especially where there is much central exhaustion, better results may be obtained by attacking the brain. Mild galvanic currents should be applied by means of large electrodes every day, or every other day, for a few minutes at a time. It is generally best to apply the anode to the forehead, and the cathode to the back of the neck; another good plan is to place the electrodes on either side of the head. Weak general Faradization may sometimes be advantageously employed in conjunction with the above.

Counter-irritation.—Counter-irritation is of great service in nervousness.

a. *Spongio-piline.*—A very convenient way of mildly stimulating the skin is to apply a piece of spongio-piline which has been previously dipped in very hot water and wrung out.

b. *Linimentum Sinapis Co.*—When gentle and long-continued stimulation of the skin is required, this is, of all liniments, the best. It may, as Gamgee has insisted, be rubbed in for a long time without producing the slightest eruption. This preparation is often sold impure.

c. *Chloroform.*—The liniment of chloroform is a very useful stimulant of the skin. A very good method

of counter-irritating is to apply equal parts of chloroform and castor oil to the skin, and then cover the part with oil silk.

d. *Dry Cupping.*—This old-fashioned treatment is not used as frequently as it ought to be. It is one of the best modes of counter-irritating. Instruments are now made by which the operation may be much more simply performed than on the old plan.

e. *Hot Iron.*—A flat-iron—as hot as can be borne—pressed against the skin produces effective counter-irritation.

f. *Blistering.*—This will ever remain a powerful therapeutic agent. In blistering for nervousness the following points should be borne in mind:—The blister should seldom or never be employed in cases of marked debility or prostration. It should be small—not larger than a pea—and the application should be frequently repeated, otherwise the effect is not likely to be permanent. The advantage of using small blisters is that we can by this means graduate the treatment better. Some are very susceptible to their influence. The position of the blisters should, of course, vary according to the nature of the case to be treated. In general nervousness they should be placed vertically on either side of the spinous processes. Very small blisters arranged in this way cause little inconvenience in movement, or otherwise.

g. *The Paquelin Cautery.*—As a rule patients object to the use of the cautery, although the pain produced

by it, if properly applied, is only slight. The skin should be lightly touched by it, and vesication and scarring should never result. The applications should be made on either side of the spine to the extent of two or three inches every day. Starting in the lower cervical region, the operator should gradually work downwards, till at the end of ten to twelve days the sacral region is reached.

Sedative Applications.—There is no need here to enumerate the various sedative applications which may be employed with advantage in many cases of nervousness. I will merely mention the great benefit which often results from the application of the spinal ice-bag, as recommended by Chapman.

CHAPTER VII.

DRUGS.

External Applications.—The following dusting powders recommended by Tilt will occasionally be found of service in flushing :—

Carmine, ½ grain, or less.	Carmine, gr. ½.
Nitrate of Bismuth, ʒj.	Camphor, ʒss.
Camphor, ʒss.	Oxide of Zinc, ʒj.
Oil of Bitter Almonds, ♏ij.	Otto of Roses, ♏j.
Starch, ℥j.	Starch, ℥ij.

I may here mention the influence of the local application of water in blushing. In one patient bathing the face in cold water increased the tendency to blush; in another it distinctly lessened it for a time.

The effect of heat in the following case was remarkable :—

Æt. 23 (woman). Subject to blushing from childhood; blushes worse the last eight years. An attack early in the day frees her for the remainder of the day; so also if she gets her face very red by bathing it in hot water or by sitting close to the fire. One side of her face gets red and heated from the fire; she will not blush for the remainder of the day on that side, but will on the other. When going to an evening party she avoids an attack by getting her face thoroughly red beforehand.

The next case is somewhat similar :—

Æt. 52 (woman). Suffers from blushing. An attack seems to free her from the tendency to blush for a time, for knowing she has had one gives her confidence in herself, and she does not fear another. If her face becomes heated and red from being too near the fire, she experiences the same immunity.

For Internal Administration.—There are, apparently, but few drugs which exercise a specific influence on flushing and blushing, though there are several which, by improving the general health, may lessen the tendency to them, notably to flushing. As regards drugs acting specifically, one naturally looks to those which influence the vaso-motor system, but seeing that the vaso-motor phenomena of the flush and blush storms are almost certainly secondary in origin, it is not surprising that the expectation is not always realized. I have thought that some of the following drugs have acted specifically, certainly they have done good, more especially in flushes.

Ergot, owing to its action on the arteries, naturally suggests itself as a possible specific. In some cases it has certainly proved efficacious. I give ten to thirty drops of the liquid extract three times a day.

Turpentine is a very valuable drug, one of the most valuable we possess, and were it not for its unpleasant taste would doubtless have long ago become very popular. Especially is it useful among the poorer classes. The poor, especially the women, suffer very largely from a slight degree of scurvy ; they also suffer much from flatulent dyspepsia and

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