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THE PHYSIOLOGY OF LAUGHTER.

BY HERBERT SPENCER.

WHY do we smile when a child puts on a man's hat? or what induces us to laugh on reading that the corpulent Gibbon was unable to rise from his knees after making a tender declaration? The usual reply to such questions is, that risibility is excited by a perception of incongruity. Even were there not on this reply the obvious criticism that laughter often occurs from extreme pleasure or from mere vivacity, as among frolicsome children, there would still remain the real problem,—How comes a sense of the incongruous to be followed by these peculiar bodily actions? Some have alleged that laughter is due to the pleasure of a relative self-elevation which we feel on seeing the humiliation of others. But this theory, whatever portion of truth it may contain, is, in the first place, open to the fatal objection, that there are various humiliations to others which produce in us anything but laughter; and, in the second place, it does not apply to the many instances in which no one's dignity is implicated: as when we laugh at a good pun. Add to which, that, like the other, it is merely a generalization of certain conditions to laughter, and not an explanation of the very odd movements which occur under these conditions. Why, when greatly delighted, or impressed with certain unexpected contrasts of ideas, should there be a contraction of particular facial muscles and particular muscles of the chest? Such answer to this question as may be possible, can of course be rendered only by physiology.

Every child has made the attempt to hold the foot still while it is tickled, and has failed; and probably there is scarcely any one who has not at some time or other vainly tried to avoid winking when a hand has been suddenly passed before the eyes. These examples of muscular movements which

occur independently of the will, or in spite of it, illustrate what physiologists call reflex-action; as likewise do sneezing and coughing. To this class of cases, in which involuntary motions are accompanied by sensations, has to be added another class of cases, in which involuntary motions are unaccompanied by sensations:—instance the pulsations of the heart; the contractions of the stomach during digestion. Further, the majority of those who have studied the subject, hold that the great mass of seemingly voluntary acts in such creatures as insects, worms, molluscs, are as purely automatic as is the dilatation or closure of the iris under variations in quantity of light; and similarly exemplify the law, that an impression on the end of an afferent nerve is conveyed to some ganglionic centre, and is thence usually reflected along an efferent nerve to one or more muscles which it causes to contract.

In a modified form this principle holds with voluntary acts. Nervous excitation always *tends* to beget muscular motion; and when it rises to a certain intensity, always does beget it. Not only in reflex actions, whether with or without sensation, do we see that special nerves, when raised to a state of tension, discharge themselves on special muscles with which they are indirectly connected; but those external actions, through which we read the feelings of others, show us that under any considerable tension, the nervous system in general discharges itself on the muscular system in general, either with or without the guidance of the will. The shivering produced by cold implies irregular muscular contractions, which, though at first only partly involuntary, become, when the cold is extreme, almost wholly involuntary. When you have severely burnt your finger, it is very difficult to preserve a dignified composure: contortion of face, or movement of limb, is pretty sure to follow.

If a man receives good news without any change of feature or bodily motion, it is inferred that he is not much pleased, or that he has extraordinary self-control—either inference implying that joy almost universally produces contraction of the muscles, and so alters the expression, or attitude, or both. And when we hear of the feats of strength which men have performed when their lives were at stake—when we read how, in the energy of despair, even paralytic patients have regained for the time the use of their limbs; we see still more clearly the relation between nervous and muscular excitements. It becomes manifest not only that emotions and sensations tend to generate bodily movements, but also that the movements are vehement in proportion as the emotions or sensations are intense.¹

This, however, is not the sole direction in which nervous excitement expends itself. The viscera as well as the muscles may receive the discharge. That the heart and bloodvessels (which, indeed, being all contractile, may in a restricted sense be classed with the muscular system) are quickly affected by pleasures and pains, we have daily proved to us. Every sensation of any acuteness perceptibly affects the pulse; and how sensitive the heart is to emotions is testified by the familiar expressions which use heart and feeling as convertible terms. Similarly with the digestive organs. Without detailing the various ways in which these may be affected by our mental states, it suffices to mention the marked benefits derived by dyspeptics, as well as other invalids, from cheerful society, welcome news, change of scene, to show how pleasurable feeling stimulates the viscera in general into greater activity.

There is still another direction in which any excited portion of the nervous system may discharge itself; and a direction in which it usually does discharge itself when the excitement is not strong. It may pass on the stimulus to some

other portion of the nervous system. This is what occurs in quiet thinking and feeling. The varied succession of states which constitute consciousness, result from this. Sensations excite ideas and emotions; these in their turn arouse other ideas and emotions, and so continuously. That is to say, the tension existing in particular nerves, or groups of nerves, when they yield us certain sensations, ideas, or emotions, generates an equivalent tension in some other nerves, or groups of nerves, with which there is a connexion: the flow of energy passing on, the one idea or feeling dies in producing the next.

Thus, then, while we are totally unable to comprehend how the excitement of certain nerves should generate a state which we call feeling—while in the production of consciousness by physical agents acting upon physical structure, we come to an absolute mystery never to be solved; it is yet quite possible for us to know by observation what are the succeeding forms which this absolute mystery may take. We see that there are three channels along which nerves in a state of tension may discharge themselves; or rather, I should say, three classes of channels. They may pass on the excitement to other nerves that have no direct connexions with the bodily members, and may so cause other feelings and ideas; or they may pass on the excitement to one or more of the motor nerves, and so cause muscular contractions; or they may pass on the excitement to the nerves which supply the viscera, and may so stimulate one or more of these.

For simplicity's sake, I have described these as alternative routes, one or other of which any current of nerve-force must take; thereby, as it may be thought, implying that such current will be exclusively confined to some one of them. But this is by no means the case. Rarely, if ever, does it happen that a state of nervous tension, present to consciousness as a feeling, expends itself in one direction only. Very generally it may be observed to expend itself in two; and, indeed, it is probable that the

¹ For numerous illustrations see essay on "The Origin and Function of Music."

discharge is never absolutely absent from any one of the three. There is, however, variety in the *proportions* in which the discharge is divided among these different channels under different circumstances. In a man whose fear impels him to run, the mental tension generated is only in part transformed into a muscular stimulus: there is a surplus which causes a rapid current of ideas. The agreeable state of feeling produced, say by praise, is not wholly used up in arousing the succeeding phase of the feeling, and the new ideas appropriate to it; but a certain portion overflows into the visceral nervous system, increasing the action of the heart, and probably facilitating digestion. And here we come upon a class of considerations and facts which open the way to a solution of our special problem.

For starting with the unquestionable assumption, that at any moment the existing quantity of liberated nerve-force, which in an inscrutable way produces in us the state we call feeling, *must* expend itself in some direction—*must* generate an equivalent manifestation of force somewhere—it clearly follows that, if of the several channels it may take, one is wholly or partially closed, more must be taken by the others; or if two are closed, the discharge along the remaining one must be more intense; and that, conversely, should anything determine an unusual efflux in one direction, there will be a diminished efflux in other directions.

Daily experience illustrates these conclusions. It is commonly remarked, that the suppression of external signs of feeling, makes feeling more intense. The deepest grief is that which makes no violent display. Why? Because the nervous excitement not discharged in muscular action, discharges itself in other nervous excitements—arouses more numerous and more remote associations of melancholy ideas, and so increases the mass of feelings. People who conceal their anger are habitually found to bear stronger feelings of animosity than those who explode in loud speech and vehement action. Why? Because,

as before, the emotion is reflected back, accumulates, and grows more intense. Similarly, men who, as proved by their powers of representation, have the keenest appreciation of the comic, are usually able to do and say the most ludicrous things with perfect gravity.

On the other hand, all are familiar with the truth that bodily activity deadens emotion. Under great irritation we get relief by walking about rapidly. Extreme effort in the bootless attempt to achieve a desired end, very greatly diminishes the intensity of the desire. Those who are forced to exert themselves after a misfortune, do not suffer nearly so much as those who remain quiescent. If any one wishes to check intellectual excitement, he cannot choose a more efficient method than running until he is exhausted. Moreover, these cases, in which the production of feeling and thought is hindered by determining the nervous energy towards bodily movements, have their counterparts in the cases in which bodily movements are hindered by an extra absorption of nervous energy in sudden thoughts and feelings. If, when walking along, there flashes upon you an idea that creates great surprise, hope, or alarm, you stop; or, if sitting cross-legged, swinging your pendent foot, the movement is at once arrested. From the viscera, too, intense mental action abstracts energy. Joy, disappointment, anxiety, or any moral excitement rising to a great height, will destroy appetite, or if food has been taken, will arrest digestion; and even a purely intellectual activity, when extreme, will do the like.

Facts, then, fully bear out these *à priori* inferences, that the nervous excitement at any moment present to consciousness as feeling, must expend itself in some way or other; that of the three classes of channels open to it, it must take one, two, or more, according to circumstances; that the closure or obstruction of one, must increase the discharge through the others, and conversely, that if to answer some demand, the efflux of nervous energy in one direction is unusually great, there must be a

corresponding decrease of the efflux in other directions. Setting out from these premises, let us now see what interpretation is to be put upon the phenomena of laughter.

That laughter is a display of muscular excitement, and so illustrates the general law, that feeling passing a certain pitch habitually vents itself in bodily action, scarcely needs pointing out. It perhaps needs to be pointed out, however, that strong feeling of almost any kind produces this result. It is not a sense of the ludicrous only which does it, nor are the various forms of joyous emotion the sole additional causes. We have, besides, the sardonic laughter and the hysterical laughter, which result from mental distress ; to which must be added certain sensations, as tickling, and, according to Mr. Bain, cold, and some kinds of acute pain.

Intense mental or physical feeling of various kinds being, then, the general cause of laughter, we have to note that the muscular actions constituting it are distinguished from most others by this, that they are purposeless. In general, bodily motions that are prompted by feelings are directed to special ends ; as when we try to escape a danger, or struggle to secure a gratification. But the movements of chest and limbs which we make when laughing have no object. And now remark that these quasi-convulsive contractions of the muscles, having no object, but being results of an uncontrolled discharge of energy, we may see whence arise their special characters—how it happens that certain classes of muscles are affected first, and then certain other classes. For an overflow of nerve-force, undirected by any motive, will manifestly take first the most habitual routes ; and if these do not suffice, will next overflow into the less habitual ones. Well, it is through the organs of speech that feeling passes into movement with the greatest frequency. The jaws, tongue, and lips are brought into action not only to express strong irritation or gratification, but that very moderate

flow of mental energy which accompanies ordinary conversation, finds its chief vent through this channel ; and hence it happens that certain muscles round the mouth, small and easy to move, are the first to contract under pleasurable emotion. The class of muscles which, next after those of articulation, are most constantly set in action (or extra action, we should say) by feelings of all kinds, are those of respiration. Under pleasurable or painful sensations we breathe more rapidly : probably as a consequence of the increased demand for oxygenated blood. The sensations that accompany exertion also bring on hard-breathing, which here still more evidently responds to the physiological needs. And emotions, too, agreeable and disagreeable, both, at first, excite respiration ; though the last subsequently depress it. That is to say, of the bodily muscles, the respiratory are more constantly implicated than any others in those various acts which our feelings impel us to ; and, hence, when there occurs an undirected discharge of nervous energy into the muscular system, it happens that, if the quantity be considerable, it convulses not only certain of the articulatory and vocal muscles, but also those which expel air from the lungs. Should the feeling to be expended be still greater in amount—too great to find vent in these classes of muscles—another class comes into play. The upper limbs are set in motion. Children frequently clap their hands in glee ; by some adults the hands are rubbed together ; and others, under still greater intensity of delight, slap their knees and sway the body backwards and forwards. Last of all, when the other channels for the escape of the surplus nerve-force have been filled to overflowing, a yet further and less used group of muscles is spasmodically affected ; the head is thrown back and the spine bent inwards—there is a slight degree of what medical men call *opisthotonos*. Thus, then, without contending that the phenomena of laughter in all their details are to be so accounted for (which they are not), we

see, that in their *ensemble* they conform to these general principles:—that feeling excites to muscular action; that when the muscular action is unguided by a purpose, the muscles first affected are those which feeling most habitually stimulates; and that as the feeling to be expended increases in quantity, it excites an increasing number of muscles, in a succession determined by the relative frequency with which they respond to the regulated dictates of feeling.

There still, however, remains the question with which we set out. The explanation here given applies only to the laughter produced by acute pleasure or pain: it does not apply to the laughter that follows certain perceptions of incongruity. It is an insufficient explanation, that in these cases laughter is a result of the pleasure we take in escaping from the restraint of grave feelings. That this is a part-cause is true. Doubtless very often, as Mr. Bain says, "it is the coerced form of seriousness and solemnity without the reality that gives us that stiff position from which a contact with triviality or vulgarity relieves us, to our uproarious delight." And in so far as laughter is caused by the gush of agreeable feeling that follows the cessation of mental strain, it further illustrates the general principle above set forth. But no explanation is thus afforded of the burst of laughter which ensues when the short silence between the *andante* and *allegro* in one of Beethoven's symphonies, is broken by a loud sneeze. In this, and hosts of like cases, the mental tension is not coerced but spontaneous—not disagreeable but agreeable; and the coming impressions to which the attention is directed, promise a gratification that few, if any, desire to escape. Hence, when the unlucky sneeze occurs, it cannot be that the mirth of the audience is due simply to the release from an irksome attitude of mind: some other cause must be sought.

This cause we shall quickly arrive at by carrying our analysis a step further. We have but to consider the quantity of feeling that exists under such circum-

stances, and then to ask what are the conditions that determine the direction of its discharge, to at once reach a solution. Take a case. You are sitting in a theatre, absorbed in the progress of an interesting drama. Some climax has been reached which has aroused your sympathies—say, a reconciliation between the hero and heroine, after long and painful misunderstanding. The feelings excited by this scene are not of a kind from which you seek relief; but are, on the contrary, a grateful relief from the more or less painful feelings with which you have witnessed the previous estrangement. Add to which, that the sentiments these fictitious personages have for the moment inspired you with, are certainly not such as would lead you to rejoice in any indignity offered to them; but rather, such as would make you resent the indignity. And now, while you are contemplating the reconciliation with a pleasurable sympathy, there appears from behind the scenes a tame goat, which, having stared round at the audience, walks up to the lovers and sniffs at them. You cannot help joining in the laughter which greets this *contretemps*. Inexplicable as is this irresistible burst on the hypothesis of a pleasure in escaping from a mental restraint, or on the hypothesis of a pleasure from relative increase of self-importance when witnessing the humiliation of others, it is readily explicable if we consider what, in such a case, must become of the feeling that existed at the moment the incongruity arose. A large mass of emotion had been produced; or, to speak in physiological language, a large portion of the nervous system was in a state of tension. There was also great expectation with respect to the further evolution of the scene—a quantity of vague, nascent thought and emotion into which the existing thought and emotion was about to pass. Had there been no interruption, the body of new ideas and feelings next excited, would have sufficed to absorb the whole of the existing nervous energy. But now, this large quantity of nervous energy, instead of

being allowed to expend itself in producing an equivalent quantity of the new thoughts and emotions which were nascent, is suddenly checked in its flow. The channels along which the discharge was about to take place are closed. The new channel opened—that afforded by the appearance and proceedings of the goat—is a very small one; the ideas and feelings suggested are not nearly numerous and massive enough to carry off the nervous energy to be expended. The excess must therefore discharge itself in some other direction; and in the way already explained, there results an efflux through the motor nerves to various classes of the muscles, producing the half-convulsive actions we term laughter.

This explanation is quite in harmony with the fact, that when, amongst a number of persons who are witness to the same ludicrous occurrence, there are some who do not laugh, it is because there has arisen in them an emotion not participated in by the rest, which is sufficiently massive to absorb all the nascent excitement. Among the spectators of an awkward tumble, those who preserve their gravity are commonly those in whom there is excited a degree of sympathy with the sufferer sufficiently great to serve as an outlet for the feeling which the occurrence had turned out of its previous course. Sometimes anger carries off the arrested current, and so prevents laughter. A good instance of this was lately furnished me by a friend who had been witnessing the feats at Franconi's. A tremendous leap had just been made by an acrobat over a number of horses. The clown, seemingly envious of this success, made ostentatious preparations for doing the like; and then taking the preliminary run with immense energy, stopped short on reaching the first horse, and pretended to wipe some dust from its haunches. In the majority of the spectators merriment was excited; but in my friend, wound up by the expectation of the coming leap to a state of great nervous tension, the effect of the baulk was to produce indignation. Ex-

perience thus proves what the theory implies; namely, that the discharge of arrested feelings into the muscular system, takes place only in the absence of other adequate channels, does not take place if there arise other feelings equal in amount to those arrested.

Evidence still more conclusive is at hand. If we contrast the incongruities which produce laughter with those which do not, we at once see that in the non-ludicrous ones the unexpected state of feeling aroused, though wholly different in kind, is not less in quantity or intensity. Among incongruities that may excite anything but a laugh, Mr. Bain instances—"A decrepit man under a heavy burden, five loaves and two fishes among a multitude, and all unfit and gross disproportion; an instrument out of tune, a fly in ointment, snow in May, Archimedes studying geometry in siege, and all discordant things; a wolf in sheep's clothing, a breach of bargain, and falsehood in general; the multitude taking the law in their own hands, and everything of the nature of disorder; a corpse at a feast, parental cruelty, filial ingratitude, and whatever is unnatural; the entire catalogue of the vanities given by Solomon, are all incongruous, but they cause feelings of pain, anger, sadness, loathing, rather than mirth." Now in these cases, where evidently the totally unlike state of consciousness suddenly produced, is not inferior in mass to the preceding one, the conditions to laughter are not fulfilled. As above shown, laughter naturally results only when consciousness is unawares transferred from great things to small—only when there is what we may call a *descending* incongruity.

And now observe, finally, the fact, alike inferable, *à priori*, and illustrated in experience, that an *ascending* incongruity not only fails to cause laughter, but produces on the muscular system an effect of exactly the reverse kind. When after something very insignificant there arises without anticipation something very great, the emotion we call wonder results; and this emotion is ac-

accompanied not by an excitement of the muscles, but by a relaxation of them. In children and country people, that falling of the jaw which occurs on witnessing something that is imposing and unexpected, exemplifies this effect. Persons who have been wonderstruck at the production of some very striking results by a seemingly inadequate cause, are frequently described as unconsciously dropping the things they held in their hands. Such are just the effects to be anticipated. After an average state of consciousness, absorbing but a small quantity of nervous energy, is aroused without the slightest notice, a strong emotion of awe, terror, or admiration; joined with the astonishment due to an apparent want of adequate causation. This new state of consciousness demands far more nervous energy than that which it has suddenly replaced; and this increased absorption of nervous energy in mental changes, involves a temporary diminution of the outflow in other directions: whence the pendent jaw and the relaxing grasp.

One further observation is worth making. Among the several sets of channels into which surplus feeling might be discharged, was named the nervous system of the viscera. The sudden overflow of an arrested mental excitement, which, as we have seen, naturally results from a descending incongruity, must doubtless stimulate not only the muscular system, as we see it does, but also the internal organs: the heart and stomach must come in for a share of the discharge. And thus there seems to be a good physiological basis for the popular notion that laughter facilitates digestion.

Though in doing so I go beyond the boundaries of the immediate topic, I cannot avoid pointing out that the method of inquiry here followed, is one which enables us to understand various phenomena besides those of laughter. Just to show the importance of pursuing it, I will indicate the explanation it furnishes of another familiar class of facts.

All know how generally it happens that a large amount of emotion disturbs the action of the intellect, and greatly interferes with the power of expression. A speech delivered with great facility to tables and chairs, is by no means so easily delivered to an audience. And every schoolboy can testify that his trepidation, when standing before a master, has often disabled him from repeating a lesson which he had duly learnt. In explanation of this we commonly say that the attention is distracted—that the proper train of ideas is broken by the intrusion of ideas that are irrelevant. But the question is, in what manner unusual emotion produces this effect; and we are here supplied with a tolerably obvious answer. The repetition of a lesson, or set speech previously thought out, implies the flow of a very moderate amount of nervous excitement through a comparatively narrow channel. The thing to be done is simply to call up in a given succession certain previously arranged ideas—a process in which no great amount of mental energy is expended. Hence, when there is a large quantity of emotion, which must be discharged in some direction or other; and when, as usually happens, the restricted series of intellectual actions to be gone through, does not suffice to carry it off; there result discharges along other channels besides the one prescribed: that is to say, there are aroused various ideas foreign to the train of thought to be pursued, and these tend to exclude from consciousness those which should occupy it.

And now observe the meaning of those bodily actions spontaneously set up under these circumstances. The schoolboy saying his lesson commonly has his fingers actively engaged—perhaps in twisting about a broken pen, or perhaps in squeezing the angle of his jacket; and if he is forbidden thus to occupy his hands, he soon again falls into the same or a similar trick. Many anecdotes are current of public speakers having incurable automatic actions of this class: barristers who perpetually wound and unwound a piece of tape;

members of parliament ever putting on and taking off their spectacles. So long as such movements are unconscious, they facilitate the mental actions. At least this seems a fair inference from the fact that confusion frequently results from putting a stop to them: witness the case narrated by Sir Walter Scott of his schoolfellow, who became unable to say his lesson after the removal of the waist-coat-button that he habitually fingered while in class. But why do they facilitate the mental actions? Clearly because they draw off a portion of the surplus nervous excitement. If, as above explained, the quantity of mental energy generated is greater than can find vent along the narrow channel of thought that is open to it; and if, in consequence, it is apt to produce confusion by rushing

into other channels of thought; then by allowing it an exit through the motor nerves into the muscular system, the pressure is diminished, and irrelevant ideas are less likely to intrude upon consciousness.

This further illustration will, I think, justify the position that something may be achieved by pursuing in other cases this method of psychological inquiry. For a complete explanation of mental phenomena, it is needful that we should trace out *all* the consequences of any given state of consciousness; and we cannot do this without studying the effects, bodily and mental, as varying in quantity at each other's expense. We should probably learn much if we in every case asked—Where is all the nervous energy gone?

SELF-HELP.¹

It were no ordinary ingratitude to be otherwise than thankful to the gatherer of such a fruitful heap of personal examples, encouragements, consolations for strugglers in the contest of life, as the well-read observant industry of the writer has brought together in this single volume. Nor is it only for gathering and selecting that our thanks are due. In the fig-orchards of sunny Sicily you shall see peasant girls and boys picking and sorting some dried figs, which the sugar of their own luscious juice as it crystallizes, shall sufficiently preserve for winter use. But lest the heap should fester for mere heapiness and sweetness, you shall see them thread the choice fruit upon some single band: a mere rush sometimes, sometimes a well-spun thread. The pleasant, manly, straightforward, yet not unskilful style of our author is that well-spun thread; and for so stringing his dry-sweet figs of anecdote and instance, we should fairly thank him likewise. Be it then clearly understood, that in what we have now to say, there lurks no sort of intention

to snarl and snap at the hand which reaches out to us a gift-book so justly welcome.

Hercules and the Waggoner, is an old fable and a true; but it is possible to read its moral wrong. "Help thyself, and Heaven will help thee," is a sound saying, if it be taken to mean, "Effort wings appeal;" an essentially bad and false one, if construed, "there is no appeal but to thine own effort." Are there not correctives and qualifications wanted, and very much wanted, in the preaching of the true doctrine "Help thyself"?

From the very first it was ruled by the supreme authority that it is not good for man to be alone. This ruling, we take it, has determined not only the undesirableness, but also the impossibility of absolute solitude and self-containedness in the true man. Self-help is, by a law of most blessed necessity, reduced to mean a personal energy in grasping those helps which are not of self nor can be. And unless this be distinctly recognised, we think that all the multiform illustrations of character and conduct, which such a biographical miscellany as we have before us can afford, must be asserted boldly to nega-

¹ Self-Help; with Illustrations of Character and Conduct. By Samuel Smiles, Author of the Life of George Stephenson. London: J. Murray, 1859.