sensitised plate. He is now engaged upon an inquiry into the physiognomic aspects of the criminal classes, on the basis of such photographs as he has been able to obtain from the prison authorities of the country—many thousands in number and so far affording a good ground for classification, but unfortunately needing to be supplemented by views of the profile and shape of head. The address is given in full in *Nature*, Aug. 23rd.

EDITOR

VIII.—NOTES AND DISCUSSIONS.

Mr. Sully on 'Physiological Aesthetics'.—I propose to say a few words in answer to Mr. Sully's criticism of my *Physiological Aesthetics*, which appeared in the last number of *MIND*. I wish merely to deal with his strictures on my theory of pleasure and pain, because I think I can show him that the cases which he adduces as weighing against that theory are either only apparent difficulties, or else, when thoroughly sifted, strong arguments in its favour. I shall take his various points in the order of their occurrence.

Mr. Sully asks (p. 388) "Even if we allow that certain sensations, as bitter tastes, which are painful in all degrees of intensity, answer to injurious stimulation, . . . how are we to bring the pains of ungratified desire under Mr. Allen's principle? The omission to include these in his view of pains is all the more remarkable, since the writer to whom Mr. Allen owes most, Mr. Herbert Spencer, has given so great a prominence to them." Now the fact is, I purposely avoided all allusion to this subject, because I did not wish to drag in an unnecessary discussion: but as I am thus compelled to state my opinion, here it is. I believe such pains hardly exist at all; while the few which do exist are very vague, are confined to highly-developed animals, and form a portion of those complex emotional feelings whose physical antecedents are still involved in great obscurity. Much confusion has arisen from the ambiguous use of words like *craving*, *appetite*, *desire*, &c.; and I think there are three distinct classes of feelings liable to be confounded under these names. First, there are the positive pains of hunger and thirst, in their extreme forms, which obviously arise from insufficient nutrition or actual unbuilding of the tissues; and these fall readily enough under the general law. Secondly, there is that uneasy feeling produced by high efficiency of any organ, which seeks, successfully or otherwise, to perform its function. This is *not* a pain, but merely a *nisus*, an impulse, a stimulus to action. As cases in point we may take the ordinary forms of hunger and thirst, which are neither pleasurable nor painful, but simply act as impellents. It is these feelings which Mr. Herbert Spencer calls "*cravings*," and to which he rightly attributes so great an importance, relatively to his own mode of treatment. But I doubt whether they should be classed at all in the same category with pleasures and pains, because they are in reality mere phenomena

of volition, though compounded or inextricably mixed up with emotional states. A good appetite, or a sexual impulse, or a tendency towards muscular action are each in themselves on the whole pleasurable, but are liable to be combined in concrete cases with positive hunger, or ideal disappointment, or painful restraint. Thirdly, there are a few instances where a gratification is suggested in the idea, while the actuality cannot be realised; as when I see or think of strawberries, but am prevented by circumstances from eating any. These are true cases of *discomfort* arising from ungratified desire, though they hardly deserve to be called by any stronger name. But they are too few in number and too slight in importance to be included in a general view of pains. They can only exist in nervous systems sufficiently complex to be capable of ideation and disappointment. Accordingly, they belong to that class of higher emotional feelings concerning whose mechanism we know as yet little or nothing; and Mr. Sully surely will not blame me for not having gone beyond my facts. As a rule I have confined myself to peripheral pains, about which something can be said with certainty, and have written very little, and that doubtfully, on the head of central pains, about which we can still only guess with more or less probability. But I have always allowed throughout for that blank and negative neutral feeling known as dullness or monotony, which results from the simple absence of pleasurable stimulation.

Again, Mr. Sully writes: "He hardly succeeds in including the effects of disagreeable combinations of colours under this law. He argues that discordant juxtapositions of colours produce their effect through a successive stimulation of the same class of optic fibres, which thus reaches the exhaustive and injurious point. It would follow from this, of course, that one and the same colour spread over a large surface would produce the pain of chromatic dissonance in its maximum degree. It need hardly be said that this consequence sufficiently illustrates the untenability of Mr. Allen's view of colour-discords." To this I would answer that a single field of colour *does* undoubtedly produce the maximum degree not of chromatic *dissonance** but of chromatic fatigue, as Mr. Sully may easily satisfy himself by the following simple experiment. Take a large sheet of white paper and cut in it a circular hole about ten inches in diameter; then place under the hole a piece of bright red or yellow paper: hold it at the average distance at which you read ordinary type, and look fixedly at the red spot for a few seconds. It will be found that the

* I must gently protest, in passing, against the employment of this word: my argument having been that all dissonance is fatigue, Mr. Sully treats it as though I had asserted that all fatigue is dissonance. I may add that the very same argument brought by Mr. Sully against my theory of colour-discord, which he rejects, might with equal force have been brought against Helmholtz's theory of note-discord, which he accepts. What would Mr. Sully say to a person who argued that on Helmholtz's principles "one and the same note, continued for a long time, would produce in the maximum degree the pain of musical dissonance"?

disagreeable anect, chromatic as well as muscular, is intense. Then remove the eye from the red spot, and let it wander with its usual freedom over the paper. It will be found that the vision is constantly shifting from the red to the white and back again, especially following the contour of the circle. It is these semi-automatic movements which ordinarily mask from us the unpleasant effects of a monochromatic field—or rather, practically prevent its occurrence. Wherever form is suggested, the eye keeps restlessly wandering to and from the boundary lines, and unconsciously shifting its forms from one shade or colour to the other. Hence, a considerable patch of one colour may cause us no perceptible annoyance, while two patches of discordant colour, each of half its size, may annoy us considerably: because in the first case we are constantly wandering off for relief to the limiting colours, and in the second we are constantly travelling to and fro over areas which alike fatigue the same perceptive elements. Hence, I believe, the common experience that a certain amount of concentration is required in order to perceive colour-discords, in proportion to the minuteness of their elements. It should be remembered that the extreme restlessness of the eye, and its continual practice of skirting round the figures represented to it, are seldom sufficiently recognised except by those accustomed to minute observation and subjective optical experimentation.

The passage, however, which seems to me most especially to demand a rejoinder is this: "What we miss is an adequate inductive basis for the generalisations put forth, and a due co-ordination of the different principles adopted. For example, the alleged correspondence between the amounts of pleasure and pain and the importance of the function certainly requires proof—and careful proof—in view of such patent facts as the torments attending an injury to the dental nerve, the comparative painlessness of many internal diseases, the slight amount of pleasure afforded by the process of digestion, and so on" (p. 339). The explanation of these seeming anomalies is so simple that I should hardly have thought them worth anticipating. First, let us take the case of toothache. All the higher animals are covered externally with a layer of non-sensitive tissue which we call the epidermis, and which undergoes many modifications for protective or other purposes. Evidently, it is highly desirable for them to be thus preserved from the action of destructive agencies in the environment. An animal which lost its hair or feathers would be exposed in a peculiarly defenceless state to enemies, weather, and rough bodies. Accordingly, natural selection has provided that these protective structures, themselves non-sensitive, should be embedded in a layer copiously supplied with nerves, so that acute pain follows the slightest attempt to remove or loosen a single one of them. More especially important are those instrumentary modifications known as nails, claws, hoofs, talons, beaks, and horns, which aid the animal in walking, digging, scraping, seizing prey, attacking or repelling enemies, and other useful actions. Accordingly we find these structures embedded in unusually sensitive layers, so fully innervated that a very slight injury is productive of

deep and excruciating pain. But of all the tegumentary tissues, the most indispensable to the higher animals are those used for mastication, the teeth. Not only are they necessary for tearing the food, but they are also used to attack enemies, to catch and hold prey, to remove obstructions, to build, carry, cut, gnaw, and excavate, in short, to do all that hands, weapons, and tools do for human beings. Naturally, the loss of such organs is of the most fatal import to every animal, and we find them, as we might expect, supplied with nerves of such size and power that the slightest strain or crack, the most unimportant shock, the mere jar of a gritty substance between their surfaces, produces a most objectionable thrill; while their actual forcible removal is probably the most intense agony of which our nature is capable. Of course, in civilised man, whose hands and implements have superseded his teeth, the nerve is comparatively useless; and we are generally conscious of its existence only when decay affects it. As things stand with us at present, the sooner the dental nerves become obsolescent the better. But if Mr. Sully had only turned from modern man to his earlier progenitors, he would not have wondered that enormous care had been taken in supplying a means of protection for the teeth.

Next, as to the painlessness of internal diseases and the slight pleasure of digestion. This difficulty is illustrated by another question of Mr. Sully's, a little further on. He asks, "Are mastication and deglutition more essential than stomachic and intestinal digestion?" I had hoped that my position on this subject was quite clear, especially after my distinct statement on pages 11 and 12; but it seems that my view has been misunderstood. Let me explain myself more fully. Pleasure and pain, being stimulants or deterrents of voluntary action, are specially connected with our cerebro-spinal system. That part of any set of functions which is voluntary is correlated with pleasures and pains: the remaining part, being automatic, could derive no advantage from such concomitants. Both in nutrition and in reproduction the initial step is voluntary, because the conditions demand that it should be so, and pleasure acts accordingly as an inducement to the first process; but when once the food is swallowed or the act of impregnation affected, the remaining processes go on automatically, and no good end could be subserved by voluntary intervention. So, too, with internal diseases. They are practically out of the reach of voluntary action, except in the special case of man, whose intellect enables him to devise means for detecting symptoms and arresting disease. But no lower animal could be one whit the better for a pain in its heart, its lungs, or its liver. Almost the only internal organ which yields us any feeling under average circumstances is the alimentary canal, which is susceptible of pain but not of pleasure; and this is just the one organ where an internal warning can be utilised even by the lower animals.

There are many other points in Mr. Sully's criticism which similarly call for notice; but I trust the few remarks given above will serve to show that a little consideration would get rid of his objections to my

theory. I hope hereafter to elaborate one or two of the ideas suggested by his criticism into illustrative essays, which will appear elsewhere; and I will therefore ask at present for no more space in the pages of *MIND* than that which has been already accorded me.

GRANT ALLEN.

Lord Rayleigh on a Gambling Paradox.—In the last No. of *MIND* Lord Rayleigh has a note upon an explanation which I had offered of a certain gambling paradox, viz., that called the Martingale or Double and Quits. As I agree with nearly all that he says, and at the same time do not see reason to alter my own opinion, I conclude that one of us must have missed the point of what the other had to say.

Take the following case:—There is a bank A which plays with a fixed average percentage of advantage in its favour. B and C engage with it on the condition that they may leave off at any point of the proceeding they please, and that until they desire to leave off no questions about their solvency will be raised. This condition is precisely the same for both.

B adopts the plan of playing for fixed stakes; the same every time, whether he has won or lost the time before. C doubles his stake after every time of losing. Is there any difference in their prospects? Obviously there is. B cannot ensure ever being left a winner, whilst C must sooner or later find himself in that position. The general reason, without going into details, is clear: B (after the first time) needs, in order to win, a succession or run of luck, and the longer succession the longer he has had to wait; whereas C only needs a single event in his favour.

I cannot but think that some appreciation of this fact is lurking in the minds of some gamblers when they so persistently advocate this plan; and recognising this, I did not for a time quite see my way to answering them. Of course no bank would ever dream of permitting such conditions, but we may postulate them for argument's sake.

I quite accept all that Lord Rayleigh says about the difference between two persons nominally playing on credit, when one has property really to stake and the other has not; but in the case in question, B and C are supposed to stand on precisely the same footing, the only difference between them consisting in the way in which they arrange their stakes. The answer therefore commonly given, or implied, that no arrangement of stakes can ever make any difference in the final result, is not in every case correct, however completely it may apply to the cases which actually occur in practice. To bring this out was the aim of the explanation which I offered in the *Logic of Chance*.

J. VENN.