

**Are the intensity differences of sensation quantitative III / by Henry J. Watt.**

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## ARE THE INTENSITY DIFFERENCES OF SENSATION QUANTITATIVE?<sup>1</sup> III.

By HENRY J. WATT.

1. *Which differences of sensation do we call intensive?*
2. (a) *What psychological place does intensity occupy amongst the attributes of sensation?*  
(b) *In what relation does intensity stand to those modes of experience which bear a close psychological affinity to sensation and its attributes?*
3. *What is meant by the term 'quantitative'?*
4. *Is intensity a multitude or a magnitude?*
5. *What other objects besides intensity are at least magnitudes?*
6. *Can intensity possibly be treated as a multitude?*
7. *The source of the confusion.*

THIS question may be specialised into a series of questions. The answers given to them will not only indicate the special points at which differences of opinion may legitimately arise, but will also show that certain differences are due to a confusion of ideas and may therefore be eliminated.

1. Which differences of sensation do we call intensive? It is agreed, I think, by all that the classification of certain differences as intensive cannot possibly be called in question. The cutaneous, muscular, gustatory, olfactory, and auditory sensations all possess the undoubtedly similar attributes of intensity. We may, of course, enquire whether intensity is native to all these groups of sensations and, if not, how they came to acquire it. But that it is there, is surely not disputed. Nor does the absence of any marked degree of variation of intensity, as for example in the articular sensations, really present a difficulty. The only important problem in this connexion is whether the particular case of visual brightness is to be classified as a form of intensity or as a form of quality or the like. But we can afford to neglect this problem

<sup>1</sup> A contribution to the Symposium presented at the Joint Meeting of the British Psychological Society, the Aristotelian Society, and the *Mind* Association in London, 7 June, 1913.

here and to confine our attention to the accepted cases of intensity. If visual brightness is to be considered intensive, the conclusions which are obtained for accepted forms of intensity will apply to it. But it is of interest to notice in passing that the proper classification of the attributes of sensation is not a perfectly simple task. There is room for serious divergence of views even at the present time<sup>1</sup>. Introspection is, of course, the only ground upon which a true classification can be founded. But it must be granted that the first, or in fact, any single, deliverance of introspection about the inherent nature and connexions of experiences is not necessarily irreproachable. We have to learn to think truly about simple experiences, just as about the objects of the physical world we live in.

2. (a) What psychological place does intensity occupy amongst the attributes of sensation? In discussing whether intensity is quantitative or not, reference is frequently made to extensity, as if the latter were undoubtedly quantitative. A certain amount of prejudice against a negative judgment regarding intensity is thus created. If this prejudice is misleading, it must be removed. I do not think that extensity can legitimately be considered to be a variable attribute. It is invariable. It is not really less present in the sensation from a 'spot' than in that from an area; there is not more of it in a square inch than in a square centimetre of colour. Nor is a low tone properly more voluminous than a high one. What there is more of in these cases is extent or volume, not extensity or voluminosity. We have indeed said for long enough that low tones are more voluminous than high ones. We had perhaps good reason to fear a confusion between the volume of a tone and the volume of the physical material, if we had used the same term for both. But nowadays this confusion can hardly occur in reference to the study of sensation. It is no longer from without, but within the field of psychology that the danger appears.

The variant commonly referred to under the name of extensity, voluminosity, and massiveness, then, is not an attribute of sensation. It is a derivative, a higher product, a *Gestalt*, like that of a line or a curve, and it is variable in the sense of being greater or less, like these. The attribute of extensity<sup>2</sup> is the common basis of extensiveness, the real ground of fusion and continuity of sensation in the midst of differences of local sign and its analogues, position and pitch, which I prefer to group under the generic name of order<sup>3</sup>. If the same

<sup>1</sup> Cf. my discussion of pitch and other cases in this *Journal*, IV. 843 ff.

<sup>2</sup> I hope to deal with this attribute more fully at another time.

<sup>3</sup> Cf. *op. cit.*

distinction is applied to the attribute of temporal extensity or duration, we obtain the following grouping of the attributes. Quality and intensity stand apart from the others, which fall into two pairs. Each pair comprises an extensive and an ordinal member and the two pairs may be named temporal and systemic. But, however tempting it may be for the purpose of systematic appearances, it is impossible to treat either quality or intensity as extensive or as ordinal in character. They are both ordinal in the sense of being self-disposing, but this peculiarity of them cannot be identified with ordinality; for upon differences in quality or in intensity none of those *Gestalten* or modes of sensory experience are founded which grow upon ordinal contents, viz. distance or interval, motion and others; and besides, quality and intensity are both more than merely self-disposing.

(b) In what relation does intensity stand to those modes of experience which bear a close psychological affinity to sensation and its attributes? These modes of experience have been forcing themselves with ever increasing insistence upon the notice of psychologists. There can be no doubt about their enormous variety and importance. Since the leading paper by Chr. v. Ehrenfels in 1890, by whom they were called *Gestaltqualitäten*, a large number of studies have been made of them<sup>1</sup>. Such modes of experience are said to be founded upon contents, which may either be other modes or in many cases elementary sensations. I believe that there is always a certain amount of resemblance between the founded mode and its founding contents or some aspect or attribute of the latter, as well as an objective psychical dependence of the mode on its founding contents. These relations seem to me to form good ground upon which a body of pure psychological theory concerned with the interconnexions and development of experience may be built up<sup>2</sup>. Many modes are variable and self-disposing, as being greater or less than one another in respect of their own peculiar phenomenal content. Distance and interval of time and motion are amongst the simplest of them, but there are many others<sup>3</sup>. The full and adequate study of these modes, their variety, relations, and theoretical explanation, is one of the newest forms of the psychological task, and will undoubtedly show itself to be one of its bulkiest parts.

In this connexion I see reason to differ from certain views indicated

<sup>1</sup> The first volume of a most valuable and important work by Karl Bühler on *Die Gestaltwahrnehmungen* has just been published (1913).

<sup>2</sup> Cf. my paper on the "Psychology of Visual Motion," in this *Journal*, vi.

<sup>3</sup> This *Journal*, iv. 157 ff. For other modes cf. Bühler, *op. cit.*

by Dr Myers in I. § 2. The modes which stand next to elementary sensation seem to be, first distance and time-interval, and then, as a combination of these two, motion. Spatiality, if it is merely simple distance, seems to me to be in the matter of psychological origin independent of motion; if it is complex, such as is the spatiality of binocular vision, it does not seem to me to involve motion as a necessary psychological antecedent at all. Nor do I see any evidence for the existence of a psychological antecedent to intensity, simpler than intensity, from which intensity might arise by the integration of two or more of its varieties, as distance may be said to be integrated out of differences in the attribute of order. Any other speculations regarding the origin of intensity seem to me to be either inventions or to rest upon mistaken correlations.

3. What is to be meant by the term 'quantitative'? It seems to be agreed that there are two possible meanings. A quantitative object is either,

(a) A collective object, whether real or ideal—a number of material particles, persons, states of mind, events, or a number of ideal numbers, lengths, forces, universals. Let us call this kind of object a multitude.

Or (b) A self-disposing object, or an object say  $a_s$ , which in virtue of its own phenomenality disposes itself amongst other objects of the same group  $a_b, a_c, a_d$ , etc., in a definite manner, so that it falls between  $a_r$  and  $a_t$ , and not between  $a_d$  and  $a_f$ , and which in these relations appears to be greater than  $a_r$  and less than  $a_t$ . This kind of object is known as a magnitude.

4. Is intensity a multitude or a magnitude? [With regard to the expression 'intensity differences' in the title of this discussion, I take it to mean, in the first place, intensities, and only in the second place, if at all, differences of intensities, such as those between  $Ia$  and  $Ib$ ,  $Ib$  and  $Ic$ .] On two points there seems to be agreement: (a) intensity is at least a magnitude; and (b) we cannot yet validly treat it as a multitude. We can, therefore, proceed to discuss the possibilities that are logically unaffected by these decisions. But before doing so it is well to turn aside for a moment and ask another question.

5. What other objects besides intensity are at least magnitudes? It is agreed, I think, that felt distance and motion and other such modes of experience or *Gestalten* are also at least magnitudes. We may, therefore, infer that the world of experience is rich in objects of this kind. Probably all forms of experience are, in some sense or to some degree, self-disposing objects. But a number of them cannot be considered to

be magnitudes, for example the above mentioned attributes of temporal and systemic order, percepts, recognition, concepts, thoughts and the like. The most obvious groups of experiential magnitudes are the modes and figures (*Gestalten*) of space and time, their combination in motions, and the various classes included under the term 'relations.' Magnitudes seem to occur by preference on what is obviously a duple or multiple foundation, such as we find in distance, succession, and change, or on what for various reasons may legitimately be held to be a duple or multiple foundation, as in minimal distances, motions, changes, etc. Feeling is one of the few cases in which a duple foundation seems to elude our grasp, but even here there is some sort of positive evidence<sup>1</sup>. But there is at least no reason to doubt that differences of intensities are magnitudes and that we find it comparatively easy to arrange them and to observe and to indicate their apparent equality. In so far as we consistently maintain their phenomenal equality, we have as much reason to believe in the validity of our introspective judgments, as we have to believe in them in other regions of introspective work. But if *a*, *b*, and *c* are not multitudes, but experiential magnitudes, we cannot suppose that judgments regarding the equality of the differences between *a* and *b* and between *b* and *c* justify the statement that the difference between *a* and *c* is twice that between either of the former pairs. For the judgment regarding *a* and *c* has no bearing on the other two judgments, and *vice versa*. All just noticeable differences are equal in being just noticeable, but that does not make them equal increments. Nor can equal differences be considered to be equal parts of another difference, *i.e.* equal increments within the latter difference. Is there any sense in calling the tone interval *g—f'* twice as great as that between *g* and *c'*, because the intervals *g—c'* and *c'—f'* are equal in being fourths? Besides, a distance is not the difference between two points, but these and the stretch between them in a unity.

It would carry me too far from the object of this discussion, were I to enquire whether any non-mental, for example, material or ideal objects, are at least or solely magnitudes. Nor do I think it would throw any light upon the object of discussion.

6. Can intensity possibly be treated as a multitude? The conclusion I wish to plead for in this discussion is that it cannot, so long as the identity of the object under discussion, namely intensity, is maintained. I would suggest that an object cannot at one and the

<sup>1</sup> Cf. my discussion of it in this *Journal*, iv. 184 ff.



same time be directly immeasurable and indirectly measurable, as Meinong<sup>1</sup> declares and as Professor Dawes Hicks<sup>2</sup> agrees. Such a proposition can have an appearance of plausibility only by the substitution of a new measurable object for the one that is directly immeasurable. This substitution may be occasioned by the close connexion of the two objects in the world of reality, but it is none the less a substitution. To speak of a surrogative form of measurement is both misleading and wrong. What the medical thermometer measures is not the patient's sensations of warmth or cold or how warm or cold he feels. In this particular instance the departure from any sort of regular correlation between magnitude of felt warmth and degree of temperature is notorious. What the physician is usually concerned to know is the temperature of his patient's body. And that is as little a surrogative measurement of his patient's feelings as the sight or taste of the physic he offers is a surrogative cure for his patient's felt discomfort, however much or little the material physic may be suited to restore the patient's body to its normal condition. No one sets out to measure the sensed distances evoked by a thermometer scale, but only the lines or lengths of that scale. The latter are measurable, as are any multiple objects, in so far as they produce regular changes upon lines or lengths. In all cases it is only that aspect of the motion of matter which by an obvious convenience has come to be called temperature that is measurable. And similarly in other such examples.

I would also submit that in every case in which the treatment of single states of mind as multitudes is in any way made to be plausible, we find a substitution of objects of the kind mentioned. So for example in Fechner's formula, which is perfectly valid in so far as  $S$  in the expression  $S = K \text{ Log } I$  means 'the numerical value of  $S$ ,' if it exists. But unfortunately this value has no real object; the object and the value are purely imaginary. The fault here does not lie in the application of mathematical symbols and processes to the data of sense; for these are most certainly applicable to the data of sense whenever we have an opportunity of dealing with multitudes of these data, *e.g.* in the statistical manipulation of records of the frequency of visual and other images, in the study of memory and so on. The error committed by Fechner consists in applying mathematical symbols and processes to the data of sense without any proper psychological or objective justification.

<sup>1</sup> *Ztschr. f. Psychol.*, 1896, xi, 239.

<sup>2</sup> Cf. pp. 168 ff.

There is no theoretical difficulty in discovering truths that are non-truths. The difficulty is always a 'practical' one. The truths 'wanted' are simply not there to be had.

The substitution of objects I speak of may also be illustrated from Dr Myers's main thesis that the physiological correlate of intensity differences is a sub-group of extensive changes. That may very well be, but the thesis, as it stands, cannot be considered to afford any interpretation or elucidation of intensity or its differences. If it is a valid hypothesis, it certainly establishes a fact, it discovers a reality, a new kind of extensive distribution of physiological processes; and it sets this reality into relation with intensity. But that is all. We are not thereby brought any nearer to a treatment of intensity as a multitude. We merely know now a relation in which intensity stands that we did not know before. It does not affect the case in the least that the object with which intensity has been shown to stand in relation is itself a multitude. Physiology can be said to throw light upon psychological matters only in so far as a sufficient number of these relations between experiences and physiological processes are discovered to warrant the inductive assumption that certain known physiological units stand in certain relations to known psychical units or that certain as yet unknown psychical units exist and are related to these known physiological units in certain ways. I do not by any means deny the possibility of this inductive procedure. But I very much doubt whether the reverse does not constitute the method of greater illuminative power.

In short, no single state of mind can be treated as a multitude, not even the idea of 100 itself. Only the object of the idea of 100 can be so treated. But I do not mean hereby to imply that every object can be treated as a multitude. We must, of course, discover and determine whether any given object can be so treated or not. If we succeed, the object is a multitude; if we do not succeed, it may often still be a multitude. We cannot tell *a priori* where we are to look for objects that are multitudes and where not. Otherwise psychologists have made a sorry waste of their time and energy. It is quite possible that someone may yet prove by new methods that behind intensity there lie psychical objects now unknown to us which are to be considered as multitudes and are responsible for the phenomenon of intensity (cf. Myers, I. § 2). But not even such a proof would enable us to look upon intensities as themselves multitudes. Such a magnitude as intensity, like the so much discussed and practically useful distance, must remain a magnitude for ever and ever.

This may be enforced by another illustration. It is possible to maintain that felt distance is *realiter* psychologically founded upon repeated (*i.e.* a multitude of) sensational elements qualified by extensity and order and that thus differences of multitudes are the real basis of the differences of magnitude found in distances. But not even that would make distance in any sense a multitude. Only its real psychological basis would be a multitude<sup>1</sup>.

If we had such as this imaginary knowledge of the real psychical basis of intensity, we might formulate the laws of mind and predict the psychical future better than we do now. But future mental states can be predicted by the knowledge of the physical world we already possess. We can, for example, arrange the illumination of a room so as to produce various mental effects. Yet that fact does not imply that we can measure intensity or its differences. Nor would the discovery I imagined.

If, finally, it be suggested that intensity can be treated as a multitude or measured by convention, I would submit that such 'measurement' is only a means of *naming* what stands in a real relation to something else that can properly be measured, as star brilliancies to the varying intensity of physical light.

7. The source of the confusion in these matters is an epistemological one—either a confusion of objects or a confusion of the immediate basis of knowledge in sensory experience with the objects of knowledge. In the latter case distance as sensed, for example, may be confused with length, felt motion or its velocity with motion through real space or the velocity of real motion. But it is surely absurd to suppose that any sort of reality—called velocity—exists that is a unitary magnitude in the sense in which colours and tones and felt velocity are such, and that nevertheless is measurable in numbers. Such a unitary reality is a myth, the hypostatization of a complex set of correlated relations in which a real or ideal object stands. Whether these relations are themselves real or ideal, actual or imaginary, makes, of course, no difference to the case.

If I rejoice in the possession of a new book, neither the possession nor the book thereby become feelings or emotions. If I know yonder tree is budding, neither the tree nor the budding thereby become either sensations, perceptions, or knowledge. They are only the objects of my knowledge and as such come into relation to my knowledge. So if I can

<sup>1</sup> Cf. the analogous theory given by E. R. Jaensch of the psychical representation of empty space, *Ztsch. f. Psychol.*, Erg.-bd. vi. 244 ff.

measure lengths, why should I worry about not measuring distances as felt (*Gestalten*), when I have already ascertained that I cannot measure them? If lengths are in fact measurable, the equality or differences of distances may be the sensory basis on which the cognitive processes of conception and knowledge involved in the act of measurement build. But that is no reason why I should require or expect to be able to measure distances. If unitary distances are not to be converted into multitudes, we must just enquire how our cognitive processes can nevertheless make measurement of lengths possible. It is futile to think distances ought somehow to be measurable or to construe them so as to imagine them measurable. A real object has certain definite properties and it stands in certain definite relations to other objects; all one can do is to find out these things by knowing. Knowing powers will never by themselves alone change the properties of objects or set them into new relations, unless these be relations to my knowing or unless I somehow act upon the objects so as to change their real relations.

It seems necessary to make these remarks as there is a consensus of opinion that we actually do not succeed in measuring mental magnitudes such as intensity; and yet attempts are made to give the impression that after all our intellect is not so ineffective and useless as it is (most perversely) considered to be and that we really do measure these magnitudes; only we do not do the measuring in these cases directly or straightforwardly but indirectly or by substitution, or to put it bluntly by make-believe.

The first part of the report deals with the general situation of the country and the progress of the various branches of industry and commerce. It is found that the country has made considerable progress in all these respects since the last report. The population has increased, and the various branches of industry and commerce have all shown a marked increase in activity. The progress has been the result of the various measures adopted by the Government, and the assistance rendered by the various branches of the community.

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