THE SPATIAL QUALE
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All these letters contain nothing that is absolutely necessary to our idea of the real artist; they are very important sources of information concerning the men — nothing more. For this reason, although much information and many observations are recorded, so that we can accompany the artist in his life, still these scraps of writing form no points which, in themselves, are such land-marks of development as paintings or events of a spiritual or political nature, under whose influence the life has changed its direction. The intention of the book was merely to give the letters and comment upon them, and this is done in a superior manner. But those who, in this book, see before them for the first time the whole activity and the life of the artist might suppose that these letters are important affairs, which they are not. To-day, indeed, the letters exchanged between Goethe and Lotta may be better known than those of Werther, and the correspondence between Schiller and Goethe may be more read than their works. This is a false tendency. Whoever studies one of Raphael's paintings, with its surrounding relations, learns more of him than he can learn from all of his letters. In these remarks I point out a peculiarity of our time, for this age prefers to seek out the most important of the secondary items, and in considering these the spirit of the whole often falls into the position of the unessential.

[*To be continued.*]

THE SPATIAL QUALE.

BY WILLIAM JAMES.

Mr. Cabot, in his acute and suggestive article on the notion of space in the July number of this journal, argues that, as it forms a system of relations, it cannot be given in any one sensation, and concludes that it is a symbol of the general relatedness of objects constructed by thought from data which lie below consciousness. However Mr. Cabot may differ in de-

tail from the authors whom he criticises, he and they are generically one; for the starting-point of their whole industry, in endeavoring to *deduce* space, lies in their regarding as the fundamental characteristic thereof the fact that any one spatial *position* can only be defined by its relation to other positions, and in their assumption that position, until thus defined, is not felt at all.

Mr. Cabot begins his article with the Hegelian thesis that extension has only negative predicates; that it signifies only the indefinite "*otherness*" of all objects of perception to each other. I am at a loss to see how such an inaccurate identification of a species with its entire genus can ever have been in favor. Otherness is not space; otherness is just — otherness, and nothing else; a logical relation between ideas of which *spatial* otherness supplies us with a very peculiar and distinct sort of instance. The ground of its distinctness from other kinds of otherness I hold to be the special form of sensibility which objects spatially comparable *inter se* awaken in us; and I shall endeavor in the following pages to prove that this form of sensibility — this quality of extension or spatial *quale*, as I have called it — exist at the outset in a simple and unitary form. The *positions* which ultimately come to be determined within it, in mutual relation to each other, are later developments of experience, guided by attention. These *relations* of position differ in no respect from the logical relations between items thought of in non-spatial regards. If I say A is farther to the left than B, my relating thought is the same as when I say a nasturtium is nearer to vermilion than a rose. When I say "An ox is larger than a sheep," my relating thought is the the same as when I say "Napoleon was more ambitious than Washington." The difference in the two cases lies wholly in the sensible *data* on which the thought works. In the one case these are spatial, in the other chromatic, in the third moral; and would be what the Germans call *intensiv* in a foruth case, if I were to say, "Camphor smells milder than ammonia."

It seems to me that the differences of opinion to which the question has given rise, have arisen in the failure to discrimi-

nate between the mere sensible quality of extensiveness, as such — the spatial *quale*, as we may call it — and the subdivision and measurement of this extension. By holding fast to this discrimination, I believe that empiricism and nativism can be reconciled, and all the facts on which they severally lay most stress receive equal justice. Almost all those who have written on the subject hitherto have seemed to regard it as axiomatic that our consciousness of the whole of space is formed by adding together our perceptions of particular spaces; that there can be no perception of any extent at all without a perception of particular positions within that extent, and of their distances and directions from each other. Extension becomes thus what the English psychologists have called it, an "aggregate of co-existing positions," and we find intelligent writers like Mr. Sully[1] speaking of "the *fallacious assumption* that there can be an idea of distance in general, apart from particular distances;" whilst Wundt similarly says:[2] "An indefinite localization, which waits for experience to give it its reference to real space, stands in contradiction with the very idea of localization, which means the reference to a determinate point of space."

If all this be true, Mr. Cabot is perfectly right in saying that we cannot be aware of space at all without being aware of it as a distinctly apprehended system of *relations* between a multitude of parts — without, in a word, performing a mental synthesis. But that we are originally aware of it without all this, can, I think, be easily shown; and this vague original consciousness of a space in which separate positions and directions have not, as yet, been mentally discriminated, deserves, if it exists at all, the name of sensation quite as much as does the color, "blue," or the feeling, "warm;" especially since, like "blue" or "warm," it seems a simple form of retinal or cutaneous sensibility, involving no muscular element whatever.

I will try first to show that into our cognition of space there necessarily enters what must be called a specific quality of

[1] Mind, vol. iii, p. 177.
[2] Psychologie, p. 430.

sensibility, *sui generis*, the spatial *quale*. This cannot possibly be analyzed into the mere notion of order or relation. Mill, Bain, and Spencer, who so strangely keep repeating that space is nothing but "the order of co-existences," forget the fact that we have co-existences which are arranged in no spatial order. The sound of the brook near which I write, the odor of the cedars, the feeling of satisfaction with which my breakfast has filled me, and my interest in writing this article, all simultaneously co-exist in my consciousness without falling into any sort of spatial order. If, with my eyes shut, these elements of consciousness give me any spatial feeling at all, it is that of a teeming muchness or abundance, formed of their mutual interpenetration, but within which they occupy no positions. For the "order of co-existences" to become the order of space, the co-existences must, in the first place, be evenly gradated, or ordered, in themselves; and, in the second place, their gradations must be enveloped in the unity of the peculiar spatial feeling.

The mind can arrange its ingredients in many orders. The order of positions in space is evenly gradated in three dimensions, but neither the even gradation, nor the three dimensions, nor both together, suffice by themselves to constitute its spatiality. We may have an evenly gradated order of luminosities from white to black; of tints from yellow, through green, to blue; of loudnesses, of all intensities, of good and evil, and so on; but the position of any item in these orders, although it may be metaphorically expressed on a spatial scale, is not directly intuited by the mind as objectively existing in such a scale. The order is really a logical one, *constructed* out of the mutual relations of the various items by the mind, which compares them. It lacks the sensible matrix, so to speak, of a unifying intuition, in which they lie imbedded as the equally logical order of related positions lies in space. Just so we may arrange items of experience in three dimensions; tones may be arranged on scales of intensity, pitch and *timbre;* colors in the orders of hue, intensity, and purity; and the entire system of all possible color and tone, thus constructed, have been symbolized to the imagination by cubes, pyramids,

spheres, and the like. But no one dreams that they exist as such, for every one is conscious that the construction is a logical one, involving a conscious comparison of remembered items and their relations. These exist separately, and to the *system* which they unitedly form there corresponds no sensible, unifying quality which the mind can immediately intuit as a unifying background, like that yielded by space to the bidimensional order of objective positions.

Space, then, as we know it, is something additional to mere co-existence and mere continuous order. The space in which items are arranged when they are intuited by us as objectively existing in spatial order, and not simply so symbolically figured, is an entirely peculiar kind of feeling, indescribable except in terms of itself. Why should we hesitate to call it an ingredient of the *sensation* yielded to us by the retina or skin, which intuits the items? Every one will admit the degree of *intensity* of a sensation to be a part of its sensible quality. The brightness of the blue sky, as I now look at it, betrays its intensity by pricking, as it were, my retina. The *extent* of the blue which I at this moment see, seems to be an attribute given quite as immediately. A broad blueness differs from a narrow blueness as immediately as a bright blueness from a sombre blueness. I may, it is true, in the exercise of conscious comparison, identify this particular brightness and blueness with a certain remembered number in a conventional scale of colors, and then think of the neighboring tints as they evenly shade away from this one. So I may, by taking thought, estimate in square feet the breadth of the blue surface, and locate by my imagination its position in that total system of real spaces which I have learnt to know as the geographic world, but which no single retinal sensation can ever give me all at once, because no single retinal image is large enough. For the *intuition* of a given objective space, with its peculiar *quale*, must not be confounded with the *notion* of the total space, in which that and all other particular spaces lie in determinate order. The latter is a real construction out of separate, but related, elements. The former is a sensation — given all at once, if at all. Any space which I can take in at one glance comes to

me as an undivided *plenum*. Were it built up, as the empiricists say, out of a vast number of perceptions of position fused together, I do not see how its quality could escape retaining something of the jerky, granulated character of its composite source. The spaces we *do* construct by adding together related positions — those, namely, which are too vast to be taken in at one glance — are, in fact, presented to consciousness in this jerky manner. The thought of the space between me and the opposite wall is perfectly smooth. The thought of the space between me and San Francisco has to be imagined as a successive number of hours and days of riding or railroading, filled with innumerable stoppings and startings, none of which can be omitted without falsifying the imagination. But if, as the empiricists say, all our space consciousness were compounded of innumerable ideas of motion and position, even the shortest space we perceive ought to be as coarse-grained, if one may so express it, as the distance from here to San Francisco.

We are thus forced to conclude that it is a simple, specific quality of retinal or cutaneous sensation. The quality of muchness or vastness, which envelops the separate positions and particular extensions which we learn to discriminate, clings to them always, colors their order, and makes it the special kind of order we call spatial. *Quâ* order, the spatial order is truly the product of relating thought; but *quâ* spatial it is a *datum* of simple sensibility. In the individual's psychic history the sensation, space, as a simple vague consciousness of vastness, comes first. The field of vision — or better, the sensation of light — can no more exist without it than without its *quantum* of intensity. But just as the degree of intensity, to be cognized as such or such a degree, requires a long education, involving memory, comparison, and recognition; so the quantity of extension, to be perceived — as a given number of feet, rods, or miles — presupposes a like education. The standard of intensity is the intensity of some remembered sensation which we choose for our absolute unit. The standard of extension is the remembered spatial sensation of vastness, or *absolute size*, which we get when certain amounts of our cutaneous surface are excited, or when on our retina we feel the image of our

hand, foot, and so forth, at a certain average or habitual distance selected as the norm.

The spatial *quale* is, then, primitively a very vague *quantum*, but it is a *spatial quantum*. The word vague means that of which the external limits are uncertain, or that which is without internal subdivisions, or both; in the technical language of logic, that which is neither "clear" nor "distinct." The vaguely spatial field of vision is made clear and distinct by being subdivided. To subdivide it means to have the attention called now to one point, now to another within its limits and upon its borders. This is a process which, amongst other things, undoubtedly involves different local sensations at different points, and feelings resulting from muscular motion. Its result is the *measurement* of the field of vision. We may admit the coincidences which Helmholtz, Wundt, and others have shown between visual space thus *measured* and the laws of muscular movement of the eye-ball; we may even allow that the measurement is almost exclusively due to an intellectual elaboration of sensations of motion or innervation. But for all that, we need not in the least suppose that the *spatiality* of the thing measured does not preëxist as a simple sensible quality.

It seems to me that all our sensations, without exception, have this spatial *quale*. I am surprised that Riehl, whose article is in other respects so just, should regard it as an exclusive endowment of the retina. What I mean by the spatial quality is what Professor Bain so often refers to as the "massiveness" of a feeling. The squeaking of a slate-pencil is less spatial than the voluminous reverberations of a thunderstorm; the prick of a pin less so than the feeling of a warm bath; a little neuralgic pain, fine as a cobweb, in the face, far less so than the heavy soreness of a boil or the vast discomfort of a colic or lumbago.[3]

[3] Should any one object that such terms as "voluminous" and "massive," applied to sound and pain, are but metaphorical, and involve no literal spatial import, we may ask him why this peculiarly spatial metaphor is used rather than any other. Evidently because of some quality in the sound or pain which distinctly *reminds us of space*. If we furthermore hold, as I do, that the only possible

The vastness of the retinal sensation seems in no essential respect, but only perhaps in amount, to differ from these. It need not surprise us to find an objectively small surface yielding, when excited, a more massive sensation than a much larger, but less sensitive, surface. How disproportionately great does the crater of a newly-extracted tooth feel! A midge buzzing against our tympanum often feels as big as a butterfly. Degree of nerve-disturbance, and extent thereof, seem to a certain extent to stand mutually in vicarious relation. The retina, then, by the mere fact of being excited, gives us the feeling of extent, and it differs from other sensitive surfaces only in the fact that we are able to fix our attention successively on its different points, to discriminate their directions, and so to measure it.

If one should admit that the first two dimensions of space may thus be called part of the simple retinal sensation, but that the intuition of depth cannot be so given, I would not only reply, with Stumpf, that we cannot feel plane space *as a plane* without in some way cognizing the cubic spaces which the plane separates, but I also would propose the following simple experiment: Let the objector sit with closed eyes, and let a friend approximate some solid object, like a large book, noiselessly to his face. He will immediately become aware of the object's presence and position — likewise of its departure. The perception here seems due to the excessive tactile sensibility of the tympanic membrane, which feels the pressure of the air differently according as an object is near it or not. To certain blind persons this sensation is a surprisingly accurate revealer of surrounding facts, and a friend of

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foundation of an analogy is a partial identity in the analogous things, we must suppose the voluminousness and massiveness in question to be, at least partially, the same with spatial bulk. Now, the category of *muchness* is the only *partial* ingredient common to all the several terms. But *muchness* is generic, and embraces temporal, numerical and intensive, as well as extensive muchness. But that peculiarity in the pain and sound which makes us call them voluminous is quite different from that which would make us call them protracted, numerous, or intense. They must, then, have some other characteristic which determines their muchness as spatial; and this, being otherwise indescribable, is what I call the simple spatial *quale*

the author, making the experiment for the first time, discriminated unhesitatingly between the three degrees of solidity of a board, a lattice-frame, and a sieve, held close to his ear. Now as this sensation is never used by ordinary persons as a means of perception, we may fairly assume that its felt quality in those whose attention is called to it for the first time, belongs to it *quâ* sensation, and owes nothing to educational suggestions. Now this felt quality is most distinctly and unmistakably one of vague spatial vastness in three dimensions — quite as much so as is the felt quality of the retinal sensation when we lie on our back and fill the entire field of vision with the empty blue sky. When an object is brought near the ear we immediately feel shut in, contracted; when the object is removed, we suddenly feel as if a transparency, clearness, openness, had been made outside of us.[4] And the feeling will, by any one who will take the pains to observe it, be acknowledged to involve the third dimension in a vague, unmeasured state.

On the peripheral parts of the retina discrimination is very imperfect, although practice may make it much less so. If the reader will fix his eye steadily on a distant point, and bring his hand gradually into the field of view, he will first see the hand, and see it as extended and possessing parts, but will be wholly unable to count the fingers. He will see objects on the same portions of the retina without recognizing what they are. In like manner if he turn his head up side down, or get into some unnatural position, the spatial *relations* of what he sees — distances, directions, and so forth — will be very uncertain, positions and measurements vague; but who will pretend that the picture, in losing its *order*, has become any the less spatial?

Just as the current psychologies assume that there can be no space before separate positions have been accurately dis-

[4] I may remark parenthetically, upon the thoroughly objective reference of this uneducated sensation. The observer is not aware of his feeling as such, but of the immediate presence or removal in space of an object. The blind persons whom I have examined with reference to their use of this sensation were entirely ignorant that it resided in the tympanum at all. They did not know how they came to feel the objects, but only that they were there.

tinguished, so they assume the perception of motion to be impossible until the positions of terminus *ad quo* and terminus *ad quem* are severally cognized, and their successive occupancies by the moving body are perceived to be separated by a distinct interval of time. As a matter of fact, however, we cognize only the very slowest motions in this way. Seeing the hand of a clock at XII, and afterwards at VI, I judge that it has moved through the interval. Seeing the sun now in the east and again in the west, I infer it to have passed over my head. But we can only *infer* that which we already generically know in some more direct fashion, and it is experimentally certain that we have the feeling of motion given us as a direct and simple *sensation*. Czermak long ago pointed out the difference between seeing the motion of the second-hand of a watch, when we look directly at it, and noticing the fact of its having altered its position when we fix our gaze upon some other point of the dial-plate. In the first case we have a specific quality of sensation which is absent in the second. If the reader will find a portion of his skin — the arm, for example — where a pair of compass-points an inch apart are felt as one impression, and if he will then trace lines a tenth of an inch long on that spot with a pencil-point, he will be distinctly aware of the point's motion and vaguely aware of the direction of the motion. The perception of the motion here is certainly not derived from a preëxisting knowledge that its starting and ending points are separate positions in space, because positions in space ten times wider apart fail to be discriminated as such when excited by the dividers. It is the same with the retina. One's fingers when cast upon its peripheral portions, cannot be counted — that is to say, the five retinal tracts which they occupy are not distinctly apprehended by the mind as five separate positions in space — and yet the slightest movement of the fingers is most vividly perceived as movement, and nothing else. It is thus certain that our sense of movement, being so much more delicate than our sense of position, cannot possibly be derived from it. A curious observation by Exner[5] completes the proof that movement is a

[5] Wiener Sitzungs Berichte, LXXII., Bd. III., Abth., § 156. 1875

primitive form of sensibility, by showing it to be much more delicate than our sense of succession in time. This very able young physiologist caused two electric sparks to appear in rapid succession, one beside the other. The observer had to state whether the right hand one or the left hand one appeared first. When the interval was reduced to as short a time as 0.044 the discrimination of temporal order in the sparks became impossible. But Exner found that if the sparks were brought so close together in space that their irradiation circles overlapped, the eye then felt their flashing as if it were the motion of a single spark from the point occupied by the first to the point occupied by the second, and the time interval might then be made as small as 0.015 before the mind began to be in doubt as to whether the apparent motion started from the right or left. On the skin similar experiments gave similar results.

We are accordingly compelled to admit a sensation of motion as such, prior to our discriminations of position in either time or space. But motion, even in this primitive state, occurs in spatial form. It thus follows that we have a feeling of space, distinct enough at any rate for motion to be apprehended as such, before we have anything like the perception of a system of related positions, distances, or directions. This feeling of space, involving as it does no consciousness of relations (though it may later evolve such consciousness), can only be called a kind of sensation.

Whether the feelings of muscular contraction and innervation, or whether the vertiginous sensation yielded by the semi-circular canals of the ear involve also a cognition of motion of this "distinct," though not "clear," kind may be left an open question. It seems, at least, not improbable that they do.[6] We should thus have a certain spatial quantifica-

[6] I have not seen Cyon's late work on the semi-circular canals, but I cannot believe him to have succeeded in proving these to be the principal space-giving organ. That they give, when excited, a vague sense of motion through a vague room is undeniable, and they make us acutely sensible of different directions and velocities in this motion. I imagine they subserve the finished structure of objective space more by their delicate discrimination of direction than in any other way. Right and left, up and down, are elementary sensations. If we take a cube and label one side *top*, another *bottom*, a third *front*, and a fourth *back*, there remains no form of words by which we can *describe* to another person which of the re-

tion given as a universal datum of sensibility. These primitive movement spaces may be at first wholly ambiguous.

Vierordt has, in fact, tried in a striking essay[7] to show that we are originally not aware whether a given movement sensation is performed by us or by something else upon us. Objectivity and subjectivity, direction, extent, and all other relative determinations are subsequent intellectual acts, presupposing memory and comparison. But these latter functions could never work their data into the spatial form unless that form already clove to the latter as sensations.

To sum up briefly my thesis: I say that the feeling arising from the excitement of any extended part of the body is felt as extended — why, we cannot say. The primary retinal sensation is a simple vastness, a teeming muchness. The perception of positions within it results from sub-dividing it. The measurement of distances and directions comes later still.

The vastness is subdivided by the attention singling out particular points within it. How this discrimination occurs we shall see later; but when it has occurred, every subdivision thus separately noticed appears as occupying a separate position within the total bigness. Several subdivisions of a sensitive surface, excited together, fuse into a broader position or bigger space than that of any one of them excited or noticed alone,[8] but smaller than the total bigness which they help

maining sides is *right* and which *left*. We can only point and say here is right and there is left, just as we should say this is red and that blue, without being able to give an idea of them in words. Now when we move our heads to the left or right new objects dart into those respective sides of the field of vision, and thus the sides of this field have their intrinsic contrast augmented by the still intenser contrast of the two feelings of direction in movement severally associated with them. Up and down, and intermediate directions, have their differentiation in consciousness improved in the same way. It may be also that our visual feeling of depth, the third dimension, is re-enforced by an associated semi-circular canal feeling of floating forward. Where the third dimension is abysmal — as in looking up to, or down from, a height — the association of a swimming, floating, or falling element is very manifest.

[7] Zeitschrift für Biologie, 1876.

[8] The single sensation yielded by two compass points, although it seems simple, is yet felt to be much bigger and blunter than that yielded by one. The touch of a single point may always be recognized by its quality of sharpness. This page looks much smaller to the reader if he closes one eye than if both eyes are open. So does the moon, which latter fact shows that the phenomenon has nothing to do with parallax.

constitute. A and B, two points simultaneously discriminated by attention, are *ipso facto* felt as outside or alongside of each other; but the amount of separating interval and the direction are at first quite vague. It is only when a third point, C, has been noticed, or rather a large number of additional points, all outside of each other, that the comparison of their distances and directions fixes and determines the distance and direction of A from B. We then feel A and B to be closer together than B and C. We feel C to be in the same direction from B as B is from A, and the like. And this gradual education determines for the first time a system of fixed positions within the total space. In a word, accurate perception of any two positions as such, presupposes separate acquaintance with other positions. The mapping out of retinal space involves much experience; the mere perception of it as spatial, none. All these are ultimate facts not deducible from anything simpler. He who believes them is certainly to be called a "Nativist," or a "Sensationalist."

It follows, from these propositions, that if a sensitive surface is affected *in its totality* by each of many different outward causes, each cause will appear with the vastness given by the surface, but the several causes will not appear alongside of each other, not even if they all excite the surface at once. The olfactory and gustatory surfaces seem to be in this predicament. Whatever excites them at all excites the whole extent of them at once; though, even in the tongue there seems to be a determination of bitter flavors to the back, and of acids to the front, edge of the organ. Spices likewise affect its sides and front, and a taste like that of alum localizes itself, by its styptic effect on the portion of mucous membrane which it immediately touches, more sharply than roast pork, for example, which stimulates all parts alike. The pork, therefore, tastes more spacious than the alum or the pepper. In the nose, too, certain smells, of which vinegar may be taken as the type, seem less spatially extended than heavy, suffocating odors, like musk. The reason of this appears to be that the former inhibit inspiration by their sharpness, whilst the latter are drawn into the lungs, and thus excite

an objectively larger surface. I will, however, not venture to dogmatize on this point.

In like manner, a sensitive surface, excited everywhere homogeneously, might only feel its total vastness without discerning positions therein. A fœtus bathed in *liquor amnii* discerns no one part of its skin more than another. But if we wet a portion of the skin, the wet part is strongly contrasted with the rest, and, with the general contrast of excitement, the contrast of local feeling simultaneously awakes. Adventitious sensations, occurring on special points of a sensitive surface, certainly call attention to the diversities of local feeling resident in the points, and make us notice their separateness in a way impossible when the surface was unexcited. In the spatial muchness of a colic — or, to call it by a more spacious-sounding vernacular, belly-ache — I can with difficulty distinguish the north-east from the south-west corner, but can do so much more easily if, by pressing my finger against the former, I am able to make the pain there more intense. I cannot feel two local differences on my skin by a pure mental act of attention, unless the local feelings are very strongly contrasted indeed, and belong to quite distinct parts of the body. But I can get the contrast of local feelings in spots much closer together by exciting them, even though each be excited in an identical way, as by compass-points. In cases of this sort, where points receiving an identical kind of excitement are, nevertheless, felt to be locally distinct, and the objective irritants are also judged multiple, — *e. g.*, compass-points on skin, or stars on retina, — the ordinary explanation of psychologists is no doubt just: We judge the outward causes to be multiple because we have discerned the local feelings of their sensations to be different. Granted none but homogeneous irritants, that organ would then distinguish the greatest multiplicity of irritants — would count most stars or compass-points, or best compare the size of two wet surfaces — whose local sensibility was the least even. A skin whose sensibility shaded rapidly off from a focus, like the apex of a boil, would be better than a homogeneous integument for spatial perception. The retina, with its exquisitely sensitive *fovea*,

has this peculiarity, and undoubtedly owes to it a great part of the minuteness with which we are able to subdivide the total bigness of the sensation it yields. On its periphery the local differences do not shade off very rapidly, and we can count there fewer subdivisions.

But I believe that the psychologists, in making the judgment of discrete cause, *always* depend on perception of discrete position, have only stated half the truth.[9] I fancy that the breaking up of the sensitive surfaces into positions depends quite as much on our recognition of the heterogeneity and multiplicity of simultaneously impinging sensations as the latter recognition depends on our noticing the positions.

Positions which would not be distinguished if excited by homogeneous stimuli have their local feelings awakened when the stimuli show a strong contrast of quality. Whatever emphasizes the quality of the adventitious feeling turns the attention more exclusively to it, and makes us, in the same act, aware of its place. Qualitative contrasts are counted *where* they belong. On the retinal margin color contrast is very imperfect. A motley object gives us nothing but a blurred perception of "something there." The *there* is as blurred as the *something*, but the moment the object breaks into two colors the *there* breaks into two spots.

It follows, from all this, that the psychologic problem which the study of space-perception suggests is not what has generally been assumed. How, after noticing certain simultaneous differences, do we come to make a spatial construction of them? That problem is unanswerable; extent cleaves immediately to every simultaneity, and position to every difference we notice within it — all by an ultimate law. Our real prob-

[9] I do not refer to the explanations of double image by misjudged doubleness of position, where two organs are used — the double pea felt with crossed fingers (see Robertson, in Mind, vol. i) and double optic images (see Wundt, Psychologie). These delusions are no doubt due to the fact that the simultaneous excitements in question most habitually come from two objects differently located. The objective judgment, however, may be readily corrected by experience without the duplicity of the local sensation, as such, being in the least altered. I deal in the text only with the local discriminations made within the continuous bigness yielded by a single organ, retina, or finger.

lem is: How come we to notice the simultaneous differences at all? How can we ever evolve parts from a confused unity, if the latter did not yield them at first? How, in a word, does a vague muchness ever become a sum of discrete constituents? This is the problem of Discrimination, and he who will have thoroughly answered it will have laid the keel of psychology.

I can only suggest here that the history of discrimination is to a great extent a history of interaction between sensations. It is due to the play of association and dissociation. In the case that now concerns us, local contrasts which would never be noticed, *per se*, are emphasized in consciousness in many ways by the addition of other feelings to them. In addition to what we have noticed already, I may make the following remarks.

In the first place, it is a law that sensations experienced in immutable association are apt not to be discriminated. We do not discriminate the feeling of contraction of the diaphragm from that of expansion of the lungs. Experienced always together, they form the simple feeling called "drawing breath." Now, the purely local peculiarities of feeling in different parts of a sensitive surface are locked into an invariable order in our experience. We should therefore naturally expect to have great difficulty in picking out any one point on the retinal surface; for example, if that surface never became the seat of other contrasts than these immutable, local differences. The difficulty would be still farther increased by the fact that, considered *in abstracto*, local differences are utterly insipid, and carry with them no difference of emotional interest. But emotional interests are the great guides to selective attention. One retinal position, therefore, could hardly be singled out from any other before an interesting object had come to occupy it. It might then share the interest of the object, and be noticed. Again, the local differences, *per se*, may be very slight quantitatively, and require an adventitious sensation, superinduced upon them, to awaken the attention. But after the attention has once been awakened in this way, it may continue to be conscious of the unaided difference; just as a sail on the horizon may be too faint for us to notice until some

one's finger placed against the spot has pointed it out to us, but may then remain visible after the finger has been withdrawn.

On the skin the purely local contrasts of feeling seem slight, whilst the adventitious sensations, that may simultaneously come and perch in different near spots, are few in kind. But who can doubt that if, instead of receiving the same kind of sensation from the outer world at each point, a square inch of the skin might be checkered all over with spots of heat and cold, of itching, throbbing, stinging, pressure, and suction, our local analysis of it would be far more delicate. But this imaginary condition of the skin is the actual condition of the retina, with its power to be simultaneously impressed by the most widely contrasted and most sharply diversified adventitious feelings. The retina can at once feel white and black, but the ear cannot so feel sound and silence. The addition of mobility to these two peculiarities of the retina multiplies enormously their separate effects as aids to discrimination. A luminous point, moving from *a* to *b* on the retina, will awaken the perception of movement in space which we saw above to be primordial; which, in fact, excites the attention more than any other retinal sensation, so that the marginal parts of the retina may be said to be mere sentinels, saying, "Who goes there?" and calling the *fovea* to the spot. The tract moved over is thus most vividly accentuated and marked off from the environment. Moreover, a sensation but dimly segregated whilst on the margin of the field of view has its quality distinctly contrasted with all the rest the moment we turn the *fovea* upon it, and may then remain distinguished when it resumes its marginal position. The number of forms and colors we learn to separate from each other is thus increased, whilst the incessant wandering of the forms and colors from point to point must inevitably, by that "law of dissociation by varying concomitants" of which I have spoken in a previous article,[10] drag the purely local feelings, not only apart from each other in consciousness, but also apart

[10] On Brute and Human Intellect. This Journal, vol. xii, p. 236.

from any constant association with particular forms and colors, and end by letting them roll out isolatedly upon the table of the mind, where they then are felt as so many positions, pure and simple.

In yet another way the local feelings, if very slight, may be discriminated by the aid of motion. It seems to be one of the laws of discrimination that two feelings, whose contrast is so slight as to pass unnoticed, may end by becoming distintinguished, in case they severally form associations with other bodies of feeling whose contrast is more massive. The massive contrast takes, as it were, the smaller one in its tow. The slightly differing feelings are dragged asunder, and afterwards, by a process we cannot explain, remain segregated and discernibly *in se*. Thus, Madeira and sherry may be indistinguishable at first to my taste; but, if I get to associate the taste of one with Brown's table and the taste of the other with Smith's, I will presently, on tasting Madeira, be reminded of Brown's dining-room by *something* in the wine, and will then use the name Madeira, which is also associated with the same experiences. Later still, the "something" itself is cognized as a characteristic flavor. To apply this to the eye, each peripheral retinal point becomes habitually associated with the one peculiar feeling of movement necessary to bring the object which occupies it to the *fovea*. If two feelings of movement are more massively contrasted, *inter se*, than two retinal local feelings, they may drag these out from their first confounded state, just as Brown's table and Smith's drag sherry apart from Madeira.

It is no wonder then that the retina, whose peculiarities of structure so enormously facilitate the intricacy of association and dissociation, should be the organ in which all discrimination, local as well as qualitative, is at its maximum.

I have said nothing yet about the quantitative measurement of retinal distances. It seems quite certainly performed by the aid of movement, which, superimposing the same line or figure on different tracts of the retinal surface, marks them off as tracts equal to each other. Feelings of innervation and contraction, quantitatively compared with each other in con-

sciousness, may also be used to estimate the equivalence of retinal tracts on which the same image cannot be successively superposed. I assuredly have nothing to add to the admirable labors of the German physiologist on the *Ausmessung des Seefeldes*, and do not venture to decide between Classen's views and those of Wundt and Helmholtz. I merely call attention to the fact that these quantitative equivalencies are woven by the muscles into a previously existing spatial surface, in which the general bearing of the several included positions is already defined. The equivalencies have no more to do with constituting the spatiality, as such, than the numbers on a block of houses have to do with constituting their habitability. Most authors assume that without muscular feelings the spatial form of consciousness could not exist at all. They either constitute it or help create it. M. Delbœuf more clearly than any one, says, in his *Psychologie comme science naturelle*, that they constitute it; and in his brilliant and original article on Vision [11] he maintains that a punctiform sense organ, which could only be excited by a line of force vertical to its surface, would, if made to move from the point A (which sends one such line down upon it) to the point B (which sends another), affect us with the consciousness that A and B were situated beside each other in space, at a distance measured by the intervening movement. If, for instance, we have a punctiform ear at the bottom of a tube which admits only such air waves as coincide with its axis, we should, according to M. Delbœuf, by rotating this tube, first upon the trombone, then upon the drum, and then upon other instruments of the orchestra, acquire a perfectly topographic field of sound, as spatial as that of the retina, the position of each sonorous ingredient being defined by the movement which calls it into existence. The reason why the actual ear gives us no such distinct field is, according to M. Delbœuf, because our ear is so constructed that, no matter which way we move it, we are always conscious of the same sounds, the utmost alteration

[11] Revue Philosophique, T. iv., pp. 173, 183. "*La faculté de se mouvoir en sachant qu'on se meut.*"

being a slight change in relative intensity. Now I believe this is entirely incorrect, and that we have not the shadow of a reason to suppose that, were the trombone to become silent the moment we moved our ear from it towards the drum, and the latter not to sound until, so to speak, we had accurately sighted it, we should form any notion that they coexisted, separated by an interval of space. Sounds and motions would form pure succession in time, like the succession of notes separated by muscular feelings in the larynx when we sing a scale.[12]

The only organ which can give a feeling of space is an extended, not a punctiform organ. When the retina fixates, first A and then B, B comes into the field without A vanishing. For a time they are actually felt to coexist as simultaneous retinal sensations, distinguished from each other by the analytic attention. This form of presence, and no mere linking by motion, makes their arrangement spatial. All that motion can do is to help us distinguish A from B as they lie side by side. In the retina it does this by rapidly altering their sensible quality. When the *fovea* is on A, A is bright; when it moves to B, B is bright. In this way it breaks A and B apart, and we perceive their separate positions. A motion which should occur without in any way altering the relative intensity or quality of the coexistent feelings would in no way aid us to distinguish them. It would help our space perception quite as little as the motion of M. Delbœuf's punctiform organ, which, by altogether annihilating A the moment B was attended to, might be considered as occupying the opposite extreme. The retina forms the golden mean.

So far, it seems to me, we have met with no great difficulties. What has made students of the subject disinclined to admit that the retinal sensations, purely as such, have a primitive, spatial collaterality in consciousness, has been the fact

[12] The ascription of height and depth to certain notes seems due, not to any localization of the sounds, but to the fact that a feeling of vibration in the chest and tension in the gullet accompanies the singing of a bass note, whilst when we sing high the palatine mucous membrane is drawn upon by the muscles which move the larynx, and awakens a feeling in the roof of the mouth.

that the same amount of excited retina can suggest the most various, absolute, and relative direction and size in the object whose image occupies it, according to the circumstances. If the native determinations of space by the retina be so overpowered by the suggestions of experience, there can, these authors think, be nothing intuitive about them.

But this difficulty is easily cleared away by reflecting that the determinations of size, shape, and so forth, in question, pertain to the objective world of things, as we deem them absolutely to exist. These objective spaces may very well not be intuitive, but constructed by Association and Selection, out of various subjective spatial experiences, partly tactile, partly locomotor, partly retinal experiences taken from other points of view than the present. And the present retinal sensation, with its spatial characteristics, may quite as well be used as a sign of these other spatial characteristics as the sound *bang* may be the sign of the widely different sound made by the explosion of a cannon. Underneath all this complex and varying objective import of the retinal sensation, the subjective sensation itself persists, with all its parts, alongside each other, in the full spatial collaterality which nativists claim for them. It is true, that most men overlook it, because the import is of more practical moment to them than the sign. But artists and physiologists train their attention to observe the sensation *in se*, and I am not aware that any one of them has ever professed to find it devoid of the spatial *quale*.

Such abundant room thus appears to be left for the achievements of empiricists in the study of this objective construction that they need not grudge to the nativists the little gift of primordial bigness and collateral subdivision which the latter are contented to "beg" at the outset of their task. The only point which, in my mind, casts the least doubt on their assumption is drawn from the ear. Though we are able by that organ to discriminate coexistent voices, or pitches, we do not necessarily arrange them alongside of each other. At most, the high tone is felt as a thin, bright streak on a broader, darker background. It may be, however, that the terminal organs of the acoustic nerve are excited all at once by sounds

of any pitch, as the whole retina would be by every luminous point if there were no dioptric apparatus affixed. Notwithstanding the brilliant conjectures of the last few years which assign different acoustic end-organs to different rates of air-wave, we are still greatly in the dark about the subject; and I, for my part, would much more confidently reject a theory of hearing which violated the principles advanced in this article than give up those principles for the sake of any hypothesis hitherto published about either organs of corti or basilar membrane.

There are but three possible kinds of theory concerning space. Either (1) there is no spatial *quale* at all, and space is a mere symbol of succession; or (2) there is a *quale* given immediately in sensation; or, finally (3), there is a *quale produced* out of the inward resources of the mind, to envelop sensations which, as given originally, are not spatial, but which, on being cast into the spatial form, become united and orderly. This last is the Kantian view. Stumpf admirably designates it as the "psychic stimulus" theory, the crude sensations being considered as goads to the mind to put forth its slumbering power. Wundt, who calls space a synthesis containing properties which its elements lack, explicitly adopts the third view, and so does Lotze. Helmholtz is so sententious (and vacillating?) that it is a little hard to class him distinctly, but there is no doubt that visual space, at any rate, is constructed for him out of non-spatial sensations of sight. The word "empiricist" in his optics means just the opposite of its ordinary signification. Mill, Bain, and Spencer seem all to have gone astray, like lost sheep. Mill, with his mental chemistry, would sometimes seem to hold the third view, but sometimes again the first. Bain sticks most to the first, but sometimes implies the third. These authors are bent on making a triumphant use of their all-sufficing principle of association. They wish, therefore, if possible, to *account* for space by it. But, between the impossibility of getting from mere association anything not contained in the sensations associated, and the dislike to allow any spontaneous mental productivity, they flounder in a dismal dilemma. Spencer joins them there.

He most explicitly denies the spatial quality to any of the elementary sensations. In his Psychology, volume 2, page 168, he says: "No idea of extension can arise from a *simultaneous* excitation" of a multitude of nerve terminations like those on the skin or the retina, since this would imply a "knowledge of their relative positions,"—that is "a preëxistent idea of a special extension, which is absurd." On page 172 he says, "No relation between *successive* states of consciousness gives in itself any idea of succession;" and, on page 218, "the *muscular* sensations accompanying motion are quite distinct from the notions of space and time associated with them."

He nevertheless vociferously inveighs against the Kantian position, that space is a spontaneous mental product. And yet he does not anywhere explicitly deny space to have a specific *quale* different from that of time.

Such abject incoherency is really pitiful. The fact is, that all these English authors are really psychical stimulists, or Kantists, at bottom. The space they speak of is a new mental product not given in the sensations. I repudiate this position because it appears to me thoroughly mythological. I have no direct experience of any such mental act of creation or production. My spatial intuitions do not occur in two times, but in one. My mind is woven of one tissue, and not chopped into joints. There is not a moment of passive non-spatial sensation, succeeded by one of active spatial perception, but the form I look at is as immediately felt as the color which fills it. If one can be called a sensation, so can the other. That higher parts of the mind are also involved in spatial perception, who can deny? They fill it with intellectual relations, as Mr. Cabot has well pointed out. But these relations, when they obtain between elements of the spatial order, do in no whit differ from the same intellectual relations when they join elements in the orders of number, in tensity, quality, and the like. The spatiality comes *to* the intellect, not from it.

One word more about Kant. Helmholtz says:[13] "By Kant the proof that space is an *a priori* form is based essentially on

[13] Mind, vol. iii, p. 213.

the position that the axioms are synthetic propositions, *a priori;* but even if this position be dropped, the space representation might still be the necessary *a priori* form in which every coextended manifold is perceived. This [*i. e.*, dropping the axioms] is not surrendering any essential feature of the Kantian position."

I make bold to differ from this. The mere innateness of the spatial form of sensibility is surely not the essence of the Kantian position. Every sensationalist empiricist must admit a wealth of native forms of sensibility. The important question is: Do they, or do they not, yield us *a priori propositions*, synthetic judgments? If our "sensation" space does this, we are still Kantians in a deeper sense by far than if we merely call the spatial *quale* a form of *Anschauung*, rather than an *Empfindung*. But if the new geometry of Helmholtz and others has upset the necessity of our axioms (and this appears to be the case; see, especially, the article just quoted), then the Kantian doctrine seems literally left without a leg to stand upon.

THE PHILOSOPHY OF THOMAS AQUINAS.

(A LETTER ADDRESSED TO THOMAS DAVIDSON, AND TRANSLATED BY HIM FOR THIS JOURNAL FROM THE ITALIAN.

[The author of the following letter, which I believe I am at liberty to print, I do not know. Last spring, when I was looking over, in Rome, the mediæval commentaries on Aristotle, and trying to discover their value for a true interpretation of his text, it was suggested to me that I should do well to consult some of the more famous Catholic doctors who made a special study of Thomas Aquinas and his commentaries on Aristotle. An opportunity having presented itself to me to do this, I seized it eagerly, and soon became satisfied that the much-maligned scholastics had understood Aristotle at least as well as any one who came after them, and, as a consequence, had a philosophy which, for thoroughness and profundity, left most succeeding systems far behind it. I became especially interested in the doctrines of the greatest of mediæval thinkers, Thomas Aquinas, and most gladly accepted the offer of Father Domenico Marinangeli, of the cathedral at Aquila, in the Abruzzi, to obtain for me a summary of that philosophy from a friend of his who knew it thoroughly, and who was at work on an exposition of it, hereafter to be given to the public. The following is this summary, which I have translated from the Italian, in the hope that it may help to interest Americans in the works of the great Catholic thinker. Our Protestant prejudices, caused by the abuses of