

Hume on Spatial Properties

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INTRODUCTION

As Lorne Falkenstein has pointed out, scholarship on Hume's account of space and time has taken giant steps forward in the past 20 years. Previously, even sympathetic Hume scholars, such as Norman Kemp Smith and Charles Hendel, criticised Hume's account on partly inadequate grounds and focused on the finite divisibility of space and time. Nowadays, our understanding of *A Treatise of Human Nature*, Book 1 (1739), part 2, in which Hume puts forward his account of spatial properties, is both more accurate and wide-ranging, thanks to the work of Donald L.M. Baxter, James Franklin, Maria Frasca-Spada, Thomas Holden, Dale Jacquette and Falkenstein himself (Falkenstein 2006, 59).

Still there are aspects of Hume's account of space and time, and related topics, that have not yet been sufficiently explored. One of the areas in which we are still in need of deeper understanding is Hume's account of the spatial properties of the perceptions of spatially extended beings, that is, bodies. In this chapter, I shall build on previous work on Hume's account of space to further our understanding of one particular aspect of Hume's theory, namely his account of

length, area, volume and figure as properties of the perceptions of bodies. Therefore, my problem in this chapter is the ontological status of the spatial properties of perceptions of bodies.

This is a difficult interpretative problem in that it is hard to find any ontological category under which these spatial properties can be subsumed. Accordingly, one part of my argument involves the negative result that spatial properties are not modes, modifications or attributes as they are normally understood by any version of substance–attribute ontology that dominated the metaphysical landscape before Hume. Instead, I argue that spatial properties in Hume are best interpreted as what are nowadays called ‘tropes’. Tropes are usually taken to be particular beings in the category of property that are qualitatively simple: they can be characterised in one way only under a determinable – for example, in itself *-e* charge, taken as a particular, is nothing but a *-e* charge (Maurin 2002, 121 and Keinänen 2011, 429). Mereologically, there are tropes that are simple, that is, tropes which have no proper parts, and tropes that are complex, i.e. tropes which do have proper parts.ⁱ Trope nominalism is an alternative both to any realist ontology that postulates universal properties and to nominalist theories that take objects rather than properties as ontologically fundamental (see below).ⁱⁱ

My thesis is that on Hume’s account every spatial property of perceptions of bodies is a mereologically complex trope: a particular being and a qualitatively simple property (appearing in one way only under a determinable). It is also abstract in the sense that distinguishing it from the perception of a body whose property it is requires a rational operation; the perception of the property is a unity with the perception of the body. However, that a spatial property is abstract in this sense does not mean that the rational operation creates it. It is present independently of any act of discernment by the understanding. Some trope theorists conceive of tropes as abstract in this specific sense (Campbell 1991, 2–3).

My argument in this chapter is part of a larger project of constructing a trope nominalist interpretation of Hume's metaphysics, which is essentially an ontology of perceptions: impressions and ideas. Previously, I have argued that Hume's simple sensible perceptions are mereologically simple tropes: in themselves, they are nothing but (qualitatively) simple properties as proper sensible qualities (Hakkarainen 2014). On my understanding of Hume, sensible perceptions are or are composed of colours, tactile qualities (*e.g.* hardness, temperature), sounds, smells and tastes that appear in one way only, that is, as some determinate quality under a given determinable. This follows from Hume's view that fundamentally we perceive qualities with our five senses. In my view, Hume's simple perceptions neither are nor involve mental acts (Hakkarainen 2014). In fact, it seems to me that the distinction between mental acts and their objects or contents is not the right way to approach Hume's theory of perceptions. A better approach to simple sensible perceptions is to take them as instances of particular qualities, that is, tropes, of which complex sensible perceptions consist. One of the reasons for this is that Hume's bundle theory of the mind amounts to a rejection of any account according to which the mind is a distinct entity underlying perceptions that are its acts, such as the Cartesian view in which ideas are, broadly speaking, modes of the thinking substance. Rather, the mind is composed of simple perceptions. Consequently, mental acts must be explained in a manner compatible with this bundle theory of the mind.ⁱⁱⁱ

My problem might appear odd to some philosophers. How can perceptions be said to have properties, spatial properties in particular? Are they not appearances or representations of things having certain properties, rather than things bearing properties? A perception of a grey stone, for instance, is a representation of a grey stone, not a grey stone with some volume and figure. Moreover, even if perceptions are beings, in so far as they are mental entities, they cannot be spatial. Mental items are nowhere. The perception of the grey stone is not a concrete thing as the stone is.

My reply to these worries is that this is not how Hume sees the matter (whether he is right or wrong about this is another matter). First of all, there is substantial textual evidence for the claim that he thinks that perceptions do exist. Hume claims, for instance:

The only existences, of which we are certain, are perceptions, which being immediately present to us by consciousness ... no beings are ever present to the mind but perceptions (T 1.4.2.47; SBN 212; see also T 1.2.6.8 and 1.4.5.10; SBN 67–68 and 235–236).^{iv}

So at least there is no in principle objection that perceptions are not beings and so cannot be said to have properties. Of course, this does not remove the obstacle that perceptions are mental items that are non-spatial. But this obstacle is removed by pointing out that Hume thinks that there are literally spatially extended perceptions, both impressions and ideas (Falkenstein 2006, 68). These perceptions do not merely represent extension (in some sense of representation) without being extended themselves—they are, indeed, extended; some impressions, for example, do present extension in the visual field (T 1.4.5.15; SBN 240). The same is true of ideas: ‘To say the idea of extension agrees to any thing, is to say it is extended’ (*ibid.*). However, this extension is not perception-independent. Rather, it depends on perceptions because it is, as will be seen below, composed of perceptions. It follows from this that there are perceptions that not only represent (in some suitable sense) spatial properties, but also have spatial properties: length, area, volume, figure and so on. So it is only natural that Hume regards perceptions as beings. Hence Hume’s account of the perception of space is an issue belonging to his metaphysics of space in so far as it is an account of spatial beings.

This chapter has a three–part structure. I begin by outlining Hume’s account of space, relying mainly on Falkenstein’s interpretation. Drawing on that interpretation, I go on to argue for a trope–nominalist account of the spatial properties of perceptions of bodies. I conclude the chapter with some tentative observations about the implications of my reading with respect to Hume’s account of spatial relations (*e.g.* distance). The issue of relations is a difficult and unduly neglected topic in Hume scholarship, although one of his most famous views concerns a relation: causation. These implications suggest that my reading has explanatory power in accounting for certain other features of Hume’s account of space.

HUME’S ACCOUNT OF SPACE

In order to understand Hume’s metaphysics of space, the first point to make is that, as Baxter has pointed out, space and extension, in the sense of extendedness, are equivalent for Hume (Baxter 2009, 131, 134).^v So every perception (impression or idea) of space is a perception of extension: perception of some extendedness.

It seems to me that Hume’s account of space is easier to grasp if one bears in mind that he is a *plenist* about perception-dependent space (at least). For Hume there is no idea (or impression) of vacuum, that is, of extension without body (T 1.2.4.2 and 1.2.5.1; SBN 40 and 53–54). Every perception of extension is full of perception of body, or to be more precise, visual or tactile simple perceptions. No perception of extension includes empty, non–visual or non–tactile, space, nor is there any perception of vacuum around or between perceptions of extension. This follows from Hume’s view that the only impressions that can present extension, visual and tactile, are or are composed of simple visual and tactile impressions that are ‘mathematical points’: unextended points in contrast to extended ‘physical points’ (T 1.2.4.3; SBN 40).^{vi} Hume believes that when a

single, simple visual or tactile impression occurs, it presents merely a colour or tactile quality but not extension. It appears as a coloured or tactile mathematical point. As Hume claims in defending his view:

Let us take one of those simple indivisible ideas, of which the compound one of *extension* is form'd, and separating it from all others, and considering it apart, let us form a judgment of its nature and qualities.

'Tis plain it is not the idea of extension. For the idea of extension consists of parts; and this idea, according to the supposition, is perfectly simple and indivisible. (T 1.2.3.13–14; SBN 38)^{vii}

The same is true of visual and tactile impressions, since impressions and ideas differ only in terms of force and vivacity (T 1.1.7.5 and 1.4.5.15; SBN 19 and 240). Hence, every perception of extension is an array of coloured or tactile mathematical points. So every perception of extension is complex. As Hume summarizes his view at T 1.4.4.8:

I ... have shewn that 'tis impossible to conceive extension, but as compos'd of parts, endow'd with colour or solidity. The idea of extension is a compound idea; but as it is not compounded of an infinite number of parts or inferior ideas, it must at last resolve itself into such as are perfectly simple and indivisible. These simple and indivisible parts, not being ideas of extension, must be non-entities, unless conceiv'd as colour'd or solid. (SBN 228)^{viii}

There are no holes in these complexes: they do not contain anything that is not coloured or tactile. Consequently—and the point is crucial—every perception of extension is a complex of coloured or tactile mathematical points situated next to each other (Falkenstein 2006, 67–69; see also Garrett 1997, 61). For example, if I have a visual impression of a line consisting of three coloured mathematical points, these points or coloured simple impressions are contiguous in space: the second is next to the first and the third is next to the second. Indeed, coloured and tactile simple perceptions are mathematical points not only because they are unextended but also because they are capable of composing extension.

In these *plena* of coloured or tactile mathematical points lying next to one another, visual and tactile perceptions of bodies are parts of the *plena*. A visual impression of a square, for example, may consist of four contiguous navy blue simple perceptions or mathematical points in the visual field, which is a *plenum*.^{ix} Indeed, every perception of body is a perception of extension because of Hume's strict nominalism. As Don Garrett stresses, there can be no genuinely general idea of extension, which would be indeterminate to some extent (1997, 61). Every perception of extension is a perception of a particular, determinate body or a compound of perceptions of bodies.^x

But what is extension itself on this view? Hume's answer is that extension is the 'order', 'manner', 'disposition', 'composition' or arrangement of coloured or tangible unextended pointed perceptions:

[T]he idea of space or extension is nothing but the idea of visible or tangible points distributed in a certain order. (T 1.2.5.1; SBN 53–54; see also 1.2.4.2; SBN 39–40)

Hume's view, then, is that extension, in its perceptions, is the order of those coloured or tactile mathematical points that compose the perception. Basically, it is the configuration of contiguous points. So the perception of extension is not a distinct perception from complex visual and tactile perceptions. It is not, say, a distinct simple perception; rather, it is the spatial composition of this perception.

But there is a puzzle. How are coloured and tactile simple perceptions capable of composing extension, given that they are themselves unextended? How can zero magnitudes compose a non-zero magnitude? In order to understand how this can be the case, let me consider the simplest possible case of Hume's complex perception of extension. This would involve the perception of a line consisting of two coloured or tangible simple perceptions, which are mathematical points, in adjacent locations: having nothing between them (not even a location). Still these points have locations in the complex perception: one of them is located at origin (0) and the other at (1). Falkenstein emphasises that the crucial point for understanding Hume's view is that the length of the line is the function of their locations rather than their magnitude (2006, 63). The length is unit 1 because $1-0=1$. It is mainly owing to this function and mathematical points capable of having adjacent locations that extension may consist of what is unextended.^{xi}

PERCEPTIONS OF SPATIAL PROPERTIES

Hume's view on space implies that the complex perception of extension and the extendedness it presents are one. This we can see by my line example. Apparently, the length of the perception of the line is one of its properties together with its colour or tactile quality, which may be complex (two colours or tactile qualities). So what *is* this putative property (length)? Is it somehow separate from the perception of the line, a distinct accident, for example? Hume's answer to the latter

question is clear: the length is not separate from the perception of the line (cf. T 1.1.7.3; 18–9). On his view, the length is nothing but the two coloured or tactile simple perceptions next to each other. The same is true of the perception of the line: it is the complex of these two simple perceptions arranged in this particular manner (Falkenstein 2006, 68). As I concluded just above, perception of extension is not distinct from visual and tactile perceptions.^{xii} So the length and the perception of the line are, indeed, one: they are a unity (which is not true of their relation to the simple perceptions that compose them).^{xiii}

The same reasoning applies to the minimal two-dimensional perception: the perception of a square with a side of unit length. It is the complex of four either coloured or tactile simple perceptions, which are adjacent mathematical points in the configuration of a square. The area of the perception of the square is ultimately the function of the locations of these mathematical points: (0,0), (1,0), (0,1), (1,1). Its area is also unit 1 as $(1-0) \times (1-0) = 1$ (not equal to the length unit 1). Metaphysically, the area, the perception of the square and its figure (square) are one. However, its side lengths are not one with any of these; they are one with the four perceptions of the shortest possible lines that are the proper parts of the perception of the square: two horizontal and two vertical lines

Recall that Hume is a plenist and every perception of a body is a part of a space. Therefore, the lesson of the line and square examples can be extended to more and more complex cases. That is, any perception of a body, whether it is one-dimensional, two-dimensional or three-dimensional, is a complex of coloured or tactile mathematical points. This perception is also one with its one-dimensional, two-dimensional or three-dimensional magnitude and figure. A tactile impression of a ball, for example, consists of a finite number of tactile mathematical points and is one with its volume and round shape.

If every perception of extension and the extension it presents are one, how should we understand Hume's view of the ontological status of spatial properties in relation to their perception, which is always a perception of some extension? Is Hume's view some kind of substance–attribute ontology according to which these properties are attributes that are borne by the perception of extension? Are they, for instance, modes of the perception of extension, which would be, broadly speaking, the Cartesian view?

In order to see how Hume answers this question, and in so doing, anticipates contemporary trope nominalism, I must return to the line example. This example shows that Hume's view cannot be understood as a version of substance–attribute ontology of the kind that dominated the metaphysical landscape before Hume. The length of the line or its figure (line) is neither an attribute that inheres in the perception of the line nor is it a mode or modification (as in the Cartesian version of substance-attribute ontology). Rather, it is one with this perception. Indeed, Hume makes it clear at T 1.4.3.7 (SBN 222) and 1.4.5.5 (SBN 233) that he rejects any form of substance–attribute ontology according to which properties depend for their existence on their bearers.

One of the major metaphysical debates in the past decades has been the discussion of 'the Problem of Universals' (Armstrong 1978, 9, 41). In its contemporary form, this problem concerns similarities of objects or their sharing of properties. For example, what is the metaphysical account of the fact that electrons are similar in respect of charge, that they share the property of $-e$ charge? In terms of my line example, the problem of universals consists in accounting for the similarity in length between two visual perceptions of lines with length unit 1. Hume says at T 1.2.3.5 (SBN 34) that this similarity is 'a resemblance of the disposition of colour'd points'. So the perceptions of the two lines resemble each other in length in virtue of their composition: they consist of two coloured, navy blue for instance, simple perceptions or mathematical points lying next to one

another. I have argued elsewhere (see Hakkarainen 2014) that these two navy blue simple perceptions are, in themselves, particular qualitatively and mereologically simple tropes. On Hume's account, when they are considered separately from any other perception, they are nothing but determinate shades of a colour: navy blue. Fundamentally, we see determinate shades of colours and perceive determinate proper sensible qualities. Hence, the similarity between the perceptions of the two lines is grounded in their trope composition. So Hume's account for this similarity is that it holds because certain tropes existing in a particular spatial order and composing the objects between which the similarity holds.

Clearly, Hume's account cannot be identified with any form of nominalism distinct from trope nominalism (Armstrong 1978, 12–17). His account is not a form of concept or predicate nominalism. For, on his view, the similarity between perceptions does not hold in virtue of the fact that the concept or linguistic predicate 'unit 1 length' is applicable to both perceptions of the lines. Rather, the concept and predicate apply to them because their length is unit 1. Nor is Hume's view a form of mereological or class nominalism. The perceptions of the lines do not share this length in virtue of being parts of the mereological sum or whole of *unit 1 length objects* or members of the class of such objects. Rather, if they are parts or members of such sums or classes, it is owing to their length and similarity in this respect.

By contrast, among the alternative positions, resemblance nominalism appears to be a more viable option. As my quote just above shows, Hume, indeed, speaks about resemblance in this context (see also T 1.1.7.7; SBN 20). However, it is not possible that he is a resemblance nominalist for a rather simple reason. According to resemblance nominalism, objects share properties such as length in virtue of their similarity. On Hume's account, perceptions share length because their trope composition is such that they resemble. That perceptions resemble in respect of length is founded

on their trope composition that is one with the length. Actually, this point only reinforces the view that Hume can be neither a mereological nominalist, nor a class nominalist, nor a resemblance nominalist. According to all these theories, objects lack any properties if their characteristic relations, parthood, membership or resemblance, do not hold. Without those relations, objects do not have length or share it, for instance. But this is not true of my line example. Even if one considers each perception of the line separately from every other perception, it appears as having a length (appears under the determinable length). It might even be that the determinate value of the length can be perceived: it is unit 1.

If this can be generalised, as I think it can be, we may conclude that Hume's account of perceptions of spatial properties are, in themselves, properties. More specifically, they are determinate particular properties, since Hume rejects indeterminate and universal perceptions (T 1.1.7.3; SBN 19). Moreover, they are entities because Hume thinks that every perception is a being and these properties are unities with certain perceptions. Recall also that the perception of any extension is literally extended in perception-dependent space. So Hume's account of perceptions of spatial properties satisfies the conditions of being a trope: a particular entity in the category of property. However, they are not mereologically simple tropes because they divide into proper parts that are tropes. Consequently, Hume's perceptions of spatial properties are tropes that are mereologically complex: particular properties that consist of other tropes as their parts.

This result is complicated by the previous conclusion that the perception of the line and its length, unit 1, are one: they are a unity. Therefore they cannot be actually distinct. Indeed, Hume thinks that their distinction is a mere distinction of reason, that is, a distinction created by the understanding rather than an actual distinction in the beings themselves (T 1.1.7.3 and 17–18; SBN 18–9 and 24–5; see also Hakkarainen 2012, 62-63). This distinction of reason requires that certain

resemblance relations between the perception of the line and other perceptions are perceived (T 1.1.7.18; SBN 25). In order to distinguish the line from its unit 1 length in their unitary perception, I have to entertain at least two resemblance relations: one to a distinct perception of a line of equal length and another to a perception of a longer line. For Hume, it is only by conceiving these two resemblance relations that I am able to make a distinction of reason between the line and its unit 1 length.

But does this not mean that Hume's account is a resemblance nominalist account? Indeed, distinguishing the perception of a spatial property (length) from the perception of an object (line) requires perceiving resemblances between the perception of the object and the perceptions of other objects. It seems to me that this does not mean that Hume's view of spatial properties is resemblance nominalist. In resemblance nominalism, objects are more fundamental than properties, in the case of a version of resemblance nominalism according to which there are properties, because properties are explained in terms of objects and their resemblances. By contrast, here it is the other way around: the perception of the line consists of properties or qualities (simple visual perceptions), which are more fundamental than the line. So Hume's view is rather trope nominalist here, too, since in trope theory properties (tropes) are more fundamental than objects. Trope theories are either bundle or substratum theories: objects are composed of tropes or of tropes plus a substratum that unifies the tropes into a unity (Maurin 2002, 123). Furthermore, as I concluded above, spatial properties are something in themselves even if *distinguishing* them from the perceptions of bodies whose properties they are requires considering their resemblance relations to the perceptions of other bodies. Nevertheless, this condition for the distinction does not mean that they cannot be tropes. Campbell, for example, thinks that tropes are abstract in the sense that distinguishing them from objects is not possible without selective attention by the

understanding or reason. Still he thinks that tropes are not creations of reason; they are something in themselves before any rational operation. (Campbell 1991, 2–3) Hume's spatial properties are not creations of reason either; they are present in their perceptions before a distinction of reason between them and the perceptions of bodies whose properties they are is made.

That Hume's spatial properties of the perceptions of bodies are indeed tropes is corroborated by the following point. The perceptions of bodies do not appear only under the guise of each particular trope that characterises them. For instance, the minimal coloured line does not present only length; it appears as being a one-dimensional figure (line) and as coloured. By contrast, when a spatial property is rationally distinguished from the perception of a body whose property it is, the spatial property does not appear multiply *under a determinable*: for example, unit 1 length (under the determinable length).^{xiv} So Hume's account of a perception of a body is that it is an object and that each of its spatial properties counts as a property (trope). The former appears in multiple manners, whereas the latter has a singular presentation under a determinable when it is distinguished from the former. The spatial properties of Hume's account of perceptions of bodies are qualitatively simple as tropes are usually taken to be.

CONCLUSION: PERCEPTIONS OF RELATIONS

This result does not concern only spatial properties, but also has implications regarding spatial relations: location, distance, direction, angle, motion and so on. Accordingly, I will sum up my argument by making tentative remarks about Hume's account of location and distance, and what it suggests about Hume's general account of relations. I shall begin with distance. On my interpretation Hume's account of distance is in fact the same as his account of length: the distance between two points or bodies is the length of the shortest line of which these two points (or the

minimal parts of the bodies) are the endpoints. For example, let us visualize a one-dimensional space or extendedness consisting of six coloured points: two navy blue points and four contiguous maroon points between them. The distance between the two navy blue points is the length of the line composed of all six contiguous points, both navy blue and maroon: unit 5. The perception of this distance is the perception of the navy blue–maroon line. The distance, as well as the length, is a complex trope that is identical with the perception of the navy blue–maroon line. The relational property of the perception of each navy blue point that is its distance to the perception of the other navy blue point must be the complex perception of the navy–blue–maroon line whose proper part the navy blue point is. So this relational property is actually being a proper part of that complex perception. It can be had only while being a part of this complex.

When the distance is between perceptions of bodies rather than points, things get more complicated. One complication is that the endpoints of the distance line are not the bodies themselves, but their constituents. For the sake of simplicity, imagine two minimal navy blue squares that are on the same level horizontally. Their distance is the line consisting of coloured points. The two endpoints of this line are either the upper or the lower navy blue points composing the right hand side of the left square and the left hand side of the right square. The relational property of each minimal square is mereologically overlapping the complex perception that is the distance line.^{xv}

Location is a more complicated matter than distance. The first point to be made is that the location of a point is a derivative rather than primitive property, contrary to what Falkenstein maintains (2006, 72). Mathematical points get their location (as well as distances to other points) only in their suitable complexes. Since extension and space are equivalent for Hume, space cannot be presented when only a single coloured or tangible point (simple perception) is entertained

separately from everything else. Any spatial property such as location presupposes space; there cannot be spatial properties without space. Hence, it is impossible that coloured and tangible simple perceptions (points)—separately and in themselves—present any spatial property. So in themselves they cannot and do not present spatial location: they acquire it only in a suitable complex. Thus, location is something that coloured and tactile simple perceptions present only derivatively.

In order to understand Hume's account of location, it is useful to return once again to my example of the line. The perception of this line is the minimal complex in which points have locations. One of them is located at (0), whereas the other one lies at (1). It does not matter which is at which location as long as their locations are (0) and (1). There are only two locations in it and the points cannot be in the same location without ceasing to exist; the line is the complex of the two points lying next to one another (T 1.2.4.5; SBN 41). How can they be said to mark these locations in the complex? The answer to this question is simply that they do so because they happen to compose the line, that is, the complex, by existing next to one another. The location of each point is thus actually being a part of the line complex, which is spatially structured in a certain manner. It follows from this that the location is indeed a derivative property of the point. It can be said to have it only when it partly composes extension. This result should come as no surprise, since location is a relational property according to Hume's relationist view of space.^{xvi}

NOTES

ⁱ. That x is a proper part of y means that x is a part of y but y is not a part of x where parthood is a primitive binary relation. So proper parthood is irreflexive. By contrast, parthood is reflexive, since everything is an improper part of itself.

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- ii. Its various forms have been defended by D.C. Williams (1953), K. Campbell (1990), P. Simons (1994), A.-S. Maurin (2002), J. Heil (2003), M. Keinänen (2005; 2011) and M. Keinänen & J. Hakkarainen (2010; 2014).
 - iii. Another reason is that Hume emphasises the qualitative simplicity of simple perceptions: he repeatedly states that they are ‘perfectly simple’ (e.g. T n.5App. and 1.4.4.8; SBN 637 and 228; see note 6). As such, they cannot be taken to contain any qualitative awareness without comprising their qualitative simplicity: appearing in one way only (Hakkarainen 2014, cf. Ainslie 2008).
 - iv. References to Hume's *Treatise* are standardly to (2007), hereafter cited as ‘T’ followed by Book, part, section, and paragraph numbers; and to (1975), hereafter cited as ‘SBN’ followed by a page number.
 - v. Accordingly, from now on when I use the word ‘extension’ I shall mean spatial extension.
 - vi. At T 1.4.5.9 (SBN 235), Hume puts it beyond doubt that his view is that only sight or colours and touch or tactile qualities (e.g. temperature, hardness) can present extension: ‘THE first notion of space and extension is deriv'd solely from the senses of sight and feeling; nor is there any thing, but what is colour'd or tangible, that has parts dispos'd after such a manner, as to convey that idea.’ As far as I know, he does not ever advance a proper argument for this view.
 - vii. That visual and tactile simple perceptions are mathematical points is also confirmed by what Hume says about perceiving two colour spots in complete darkness: ‘as these perceptions are each of them simple and indivisible, they can never give us the idea of extension.’ (T 1.2.5.12; SBN 57–58) Moreover, consider his words that ‘the minutest parts we can conceive are mathematical points’ (T 1.2.4.21; SBN 46–47). That visual and tactile points are unextended for Hume is corroborated by his geometrical definition of a point: ‘[...] A point [is defined] to be what has neither length, breadth nor depth.’ (T 1.2.4.9; SBN 42)
 - viii. There is a complication in this quote, since Hume speaks about solidity instead of tangibility or tactile qualities. But here he must mean hardness rather than solidity proper (impenetrability) because just after the quote he argues that solidity proper cannot be felt by touch (T 1.4.4.13–14; SBN 230–231).
 - ix. Here I set aside the complication that many bodies are perceived to have both visual and tactile qualities (e.g. a colour and hardness). This complication does not affect my argument because visual or tactile qualities alone can compose spatial properties, which are the topic of this paper.
 - x. One of the implications of Hume's account is that there are literally many distinct spaces. For example, my visual space now is different from your visual space at the same time since our visual perceptions

or fields are distinct. Also, my visual and tangible spaces are distinct, since their perceptions are distinct. However, this complication is not relevant for my argument. For my purpose, it will suffice to study the spatial properties presented by each perception of extension.

- ^{xi}. According to Falkenstein, this corresponds to the concept of a discrete space in mathematics: ‘A space is discrete only if (but not if), for any line in that space, every point on that line except the first (if there is one) has an immediate predecessor, and every point on that line except the last (if there is one) has an immediate successor, where ‘immediate’ means that there are no other intervening points.’ (2006, 62–63)
- ^{xii}. This is a relational conception of space: space is not some entity over and above extended entities. For instance, the perception of the length of the minimal line (unit 1) is not something really distinct from the complex of two simple coloured or tactile perceptions.
- ^{xiii}. So Hume must mean this unity rather than compositional simplicity when he speaks of ‘this simplicity’ of ‘the body figur’d’ in the context of a distinction of reason (T 1.1.7.18; SBN 25). I have to use the notion of unity instead that of identity since this case is synchronic (at a time) rather than diachronic (over time). For Hume, identity is always diachronic (T 1.1.5.4; SBN 14).
- ^{xiv}. Under another determinable, of course, it appears as either coloured or tactile.
- ^{xv}. For Hume, motion must be connected to distance as motion is change of kinetic status.
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