Hume Studies
Volume 39, Number 2, 2013, pp. 131–168

Hume on the Idea of a Vacuum

LORNE FALKENSTEIN

Abstract: Hume had two principal arguments for denying that we can have an idea of a vacuum, an argument from the non-entity of unqualified points and an argument from the impossibility of forming abstract ideas of manners of disposition. He also made two serious concessions to the opposed view that we can indeed form ideas of vacua, namely, that bodies that have nothing sensible disposed between them may permit the interposition of other bodies without any apparent motion or occlusion and that it is possible to conceive the contents of a room to be evacuated without being compelled to conceive the walls moving into contact. To reconcile these concessions with his arguments and show why we only "falsely imagine" that we can form the idea of a vacuum (T 1.2.5.14; SBN 58), Hume developed a psychological theory of the perception of "invisible and intangible distance" that has something in common with Berkeley's account of the perception of outward distance. This paper argues that this theory is both untenable and inconsistent with fundamental Humean principles. It explains why Hume should have rejected the two arguments against the idea of a vacuum and why accepting ideas of vacua would have been more in line with the rest of his thought than attempting to deny that we have any such ideas.

Early modern natural philosophers were divided over the question of whether a vacuum can exist in nature. Hume wanted no part of that debate: "My philosophy . . . pretends only to explain the nature and causes of our perceptions, or impressions and ideas" (T 1.2.5.26; SBN 64).[1] But on the topic of the nature and causes

Lorne Falkenstein, Department of Philosophy, The University of Western Ontario, 1151 Richmond Street, London, Ontario, Canada, N6A 5B8. Email: lfalkens@uwo.ca.

of our perceptions, he did maintain that "we can form no idea of a vacuum, or space, where there is nothing visible or tangible" (T 1.2.5.1; SBN 53). "The frequent disputes concerning a vacuum . . . prove not the reality of the idea, upon which the dispute turns," he charged, as there is "nothing more common than to see [people] deceive themselves in this particular" (T 1.2.5.22; SBN 62). As with the cases of free will and necessary connection, the idea people actually have fails to satisfy all the parts of the verbal definition they give of it, though it satisfies a large enough part of the definition to explain how they could be deluded by the resemblance.[2] In what follows, I argue that Hume's reasons for claiming that we can form no idea of a vacuum are inadequate and inconsistent with some of his most fundamental commitments. Those commitments should have led him to accept that we can not only form ideas but also have impressions of empty spaces.

Hume had two arguments for denying that we can have an idea of a vacuum. These arguments are reconstructed in part 1 below. He also made two concessions to the opposed view that we can, indeed, form ideas of vacua. These concessions and the reasons why he had to make them are examined in part 2. To reconcile his concessions with his arguments and show why we only "falsely imagine" that we can form the idea of a vacuum (T 1.2.5.14; SBN 58), Hume developed a psychological theory of the perception of "invisible and intangible distance" that has something in common with Berkeley's account of the perception of outward distance. This theory is presented in part 3. Part 4 argues that this theory is both untenable and inconsistent with fundamental Humean principles. Part 5 explains why Hume should have rejected the two arguments against the idea of a vacuum and why accepting ideas of vacua would have been more in line with the rest of his thought than attempting to deny that we have any such ideas.

1. Hume's Reasons for Denying the Idea of a Vacuum

Hume believed that his rejection of the infinite divisibility of space entails rejecting impressions and ideas of a vacuum. "Our system concerning space and time consists of two parts," he wrote, "which are intimately connected together" (T 1.2.4.1; SBN 39). The first part is the tenet that any finite space must consist of a finite number of simple and indivisible parts. "The other part of our system," he declared, "is a consequence of this. The parts, into which the ideas of space and time resolve themselves, become at last indivisible; and these indivisible parts, being nothing in themselves, are inconceivable when not fill'd with something real and existent" (T 1.2.4.2; SBN 39). To maintain that space is not infinitely divisible is to maintain that space is divisible down to parts or "points" that are not further divisible (T 1.2.3.13.14; SBN 38). Hume claimed that such points would have to lack all size or extension, since whatever has size or extension can at least be conceived to be further divided (T 1.2.4.3; SBN 40).[3] But if these points lack all

size or extension, there would seem to be nothing to them and hence nothing at all that is conceived by the mind when we attempt to imagine them or given by the senses when we attempt to perceive them (T 1.2.3.14; SBN 38 and T 1.2.4.3; SBN 40). Hume inferred that an imaginable or sensible extension could not be composed of such parts (T 1.2.3.14; SBN 38 and 1.2.4.3; SBN 40). However, he went on to maintain, if we suppose that the points have an *intensive magnitude* or quality, then even though they might lack all *extensive magnitude* or size, we can escape the consequence. There would be something real to them that prevents them from being mere non-entities and that makes them conceivable or sensible (T 1.2.3.15; SBN 38–39 and T 1.2.4.3; SBN 40). This commits us, however, to the consequence that every point in space must be the locus of some quality, from which it follows that there can be no idea in thought and no impression in sensory experience of an empty space (T 1.2.3.16; SBN 39).

In offering this argument, Hume showed no concern with the "summation problem" that troubled many of his predecessors: how can parts that have no magnitude or extension compose something that does?[4] The problem Hume was concerned with at *Treatise* 1.2.4.2 (SBN 39–40) is a rather different, existence problem: how can there *be* parts of space if those parts lack all extension? If Hume had any concern with the summation problem, his answer to it would have to be found elsewhere.[5]

I have described Hume's problem as an existence problem rather than as an experience or a presentation problem. I have done this because of the ontological terms in which Hume presented it. The concern, as he put it, is that a simple and indivisible "idea" or "point" or "atom" or "corpuscle"[6] would be a "non-entity" were it not endowed with some quality, and that it is "absurd" that a "real existence" should be "compos'd of non-entities" (T 1.2.3.14; SBN 38, see also T 1.2.4.3; SBN 40). To address this ontological concern by claiming that the simple component parts must have some other quality to make them "real" is to over-run the reticence about what exists in nature alluded to at the outset of this paper. It is to say that there can be no such thing as a vacuum—that the concept involves the absurdity of a real existence composed of non-entities.

This having been said, the existences Hume was principally concerned with are ideas: what he described as "those simple and indivisible ideas of which the compound one of *extension* is form'd" (T 1.2.3.13; SBN 38) and as "the compound idea of extension." The latter is an idea that is not simply "of" a compound but is itself "compounded of parts" (T 1.2.3.14; SBN 38 and T 1.2.3.12; SBN 38). "We are wont to dispute concerning the nature of mathematical points," he wrote, "but seldom concerning the nature of their ideas" (T 1.2.3.14; SBN 38). Read charitably, therefore, Hume was just concerned with the epistemological question of what is required for a simple and indivisible impression to be experienced or for a simple and indivisible idea to be conceived, and in either case, he did not mean or at least

was not concerned to extend the results of that investigation to draw metaphysical or physical conclusions. That is how I shall understand him in what follows. His solution to what I have called the "existence" problem is principally intended as a solution to a perception problem and a conceivability problem.

Hume had a second reason for denying that we can form ideas of vacua. This reason is premised on his analysis of the idea of space. To properly discover what is involved in this idea, we need to consider the impressions from which the idea was copied (T 1.2.3.1; SBN 33). These impressions, according to Hume, consist of unextended, visible or tangible points. But that is not all. The points must be "disposed" in a certain fashion: they must be simultaneously present and simultaneously presented as above, below, to the left, to the right, and perhaps also before and behind one another (T 1.2.3.4; SBN 34). This makes the impression of space a rather different sort of compound impression from what we might have thought. It is not a compound of spaces. It is a compound of a manner of disposition and of extensionless things disposed in that manner. The manner of disposition is a further feature that exists in addition to the things, but it is not separable from the things or from the compound impression. We might call it an ordering relation on the components rather than a component in its own right (T 1.2.3.10; SBN 36–37).

Hume considered this to be a further reason for denying ideas of vacua: "If the second part of my system be true, *that the idea of space or extension is nothing but the idea of visible or tangible points distributed in a certain order*; it follows, that we can form no idea of a vacuum, or space, where there is nothing visible or tangible" (T 1.2.5.1; SBN 53).

This argument is premised on the plausible claim that there can be no manner of disposition unless there are things disposed in that manner. But why should it follow from this that we cannot form an idea of a manner of disposition apart from an idea of disposed elements? Hume declared that "[w]herever the imagination perceives a difference among ideas, it can easily produce a separation" (T 1.1.3.4; SBN 10). Since the manner of disposition is not a disposed element, it is different from them. Why, then, should we not be able to separate the manner of disposition from the disposed elements, and so form an idea of the one apart from the other? Why, yet more seriously, should it follow that the disposed elements could not be conceived to be disposed on either side of an unoccupied gap as well as disposed immediately alongside one another? Even if there is some reason why we are incapable of forming an idea of a manner of disposition apart from thinking of any disposed elements, why should we need to think that elements need to be disposed at every possible location defined by the "manner?" Addressing these questions requires taking a detour to consider what Hume had to say about the separability and abstraction of ideas.

Hume wrote, "We have observ'd, that whatever objects are different are distinguishable, and that whatever objects are distinguishable are separable by the

thought and imagination. And we may here add, that these propositions are equally true in the *inverse*, and that whatever objects are separable are also distinguishable, and whatever objects are distinguishable are also different" (T 1.1.7.3; SBN 18). This remark is both surprising and problematic. It is surprising because the reader is hard-pressed to recall any earlier discussion, explanation, justification, or even any allusion to these principles. Lacking that, it is not immediately obvious what should be considered to make things different and so distinguishable and separable, or vice versa.

In their annotations to the *Treatise*, David and Mary Norton have identified T 1.1.3.4 (SBN 10) as the earlier observation Hume referred to at T 1.1.7.3 (SBN 18).[7] In that passage, Hume declared that the imagination has a power to transpose and change the ideas it copies from impressions, observing that "[w]herever the imagination perceives a difference among ideas, it can easily produce a separation" (T 1.1.7.3; SBN 18). But what constitutes a difference? We might look to the two reasons Hume gave for claiming that the imagination is able to transpose and change ideas: that "all our ideas are copy'd from impressions, and . . . there are not any two impressions which are perfectly inseparable" (T 1.1.3.4; SBN 10) and that "this is an evident consequence of the division of ideas into simple and complex" (T 1.1.3.4; SBN 10). But what makes impressions two rather than one? And what makes ideas simple rather than complex?

The remark on the distinction between simple and complex ideas suggests that a look back at that distinction might provide some illumination. But there all we are told is that "[s]imple perceptions or impressions and ideas are such as admit of no distinction nor separation. The complex are the contrary to these, and may be distinguish'd into parts" (T 1.1.1.2; SBN 2). This is not very helpful. It only contributes the further term, "distinct," to the earlier "different," "distinguishable," and "separable," without telling us what would entitle us to declare that something admits of "no distinction nor separation" and may not be "distinguish'd into parts."

However, Hume did go on to give a rather more helpful example: "Tho' a particular colour, taste, and smell are qualities all united together in this apple, 'tis easy to perceive they are not the same, but are at least distinguishable from each other" (T 1.1.1.2; SBN 2). Impressions arising from different senses and the ideas that copy them must be distinguishable, and so, different and distinct and separable. What makes them distinguishable? Here a ready answer suggests itself. Impressions coming from different senses would have to be distinguishable because we might exercise the one sense, and so obtain the one impression, while not exercising or lacking the other. Therefore, the one impression could exist apart from the other. That would certainly make the one different from the other. With this "existential" criterion for difference secured, distinctness, distinguishability, and separability would all follow. We might sum up this line of thought by saying that

the bare possibility of the separate existence of impressions entails that the imagination has a power to separately conceive the ideas that copy those impressions.

Though Hume did not enunciate this existential criterion in so many words, there is a good historical reason for ascribing it to him. Hume introduced his account of the abstraction and separation of ideas by tipping his hat to Berkeley, whose position on abstraction he declared to be "one of the greatest and most valuable discoveries that has been made of late years in the Republic of Letters" (T 1.1.7.1; SBN 17). In delineating what can and cannot be abstracted or separated, Berkeley had written,

> I own myself able to abstract in one sense, as when I consider some particular parts [or] qualities separated from others, with which though they are united in some object, yet, it is possible they really exist without them. But I deny that I can abstract one from another, or conceive separately, those qualities which it is impossible should exist so separated.[8]

Interestingly, Berkeley made it clear that it goes both ways. The possibility of separate existence implies the possibility of separate conception by the imagination, and the impossibility of separate existence, the impossibility of separate conception. It is only to be expected that this existential criterion would have been in the back of Hume's mind as well.

The existential criterion also helps to make sense of Hume's claim that the liberty of the imagination to transpose and change its ideas follows from the fact that "all our ideas are copy'd from our impressions, and that there are not any two impressions which are perfectly inseparable" (T 1.1.3.4; SBN 10). The claim may really be that the possibility of the separate existence of the original impressions is foundational for what can be separately conceived by the imagination.

Once the possibility of the separate existence of the original impressions is recognized as a criterion for what ideas can be separately conceived by the imagination, we can take a step beyond Hume's example of impressions that originate from different sense organs. Impressions that originate from the same sense ought to be distinct, and different, and separable as well, as long as they could possibly exist independently of one another. That would have to be the case for any impressions that occur at different times, however closely they resemble one another. As Hume was fond of pointing out, the course of nature could change. If the course of nature *could* change, then the course of nature *could have* changed. It could have been different than it in fact was. That is, the earlier impression could have been followed by a different later impression. Therefore, any two impressions occurring at different times must be distinct and different and distinguishable, regardless of how similar they may be in all other respects.

The same holds for space. When speaking of the origin of the idea of space, Hume described the impression of a collection of identically purple points, constituting a table top, as being "alone sufficient by its view to give me the idea of extension" (T 1.2.3.4; SBN 34).[9] For any two immediately adjacent points, move your eyes so the edge of your visual field falls between the two. Then one of the two exists apart from the other, at least so far as you know on the basis of sense experience. Any conclusions about the continued unperceived existence of the other are based not on experience but on a merely probable inference. Any of a variety of causes may destroy objects not currently within our field of view, if for no other reason than that the course of nature may change, and that part of the world no longer within view may be radically altered. The same holds for the experience of tangible points making up the table. Therefore, just being disposed at different locations in space should suffice to establish that things could possibly exist separately, and consequently that they are separately conceivable by the imagination, however closely they might resemble one another in all other respects.

Again, what Berkeley had written about the senses in which abstraction is possible provides additional historical support for ascribing this further, spatiotemporal criterion to Hume.[10] According to Berkeley, "I have a faculty of imagining, or representing to myself the ideas of those particular things I have perceived and of variously compounding and dividing them. . . . I can consider the hand, the eye, the nose, each by itself abstracted or separated from the rest of the body (Berkeley, *Principles*, introduction x). As the examples make clear, the compounding and dividing Berkeley had in mind is the compounding and dividing of spatially mobile and extended parts. Like Berkeley, Hume supposed that the mere fact of being differently located in time or space suffices to put the imagination in a position to form separate ideas of the differently disposed parts and consequently makes these parts distinct and different and distinguishable.

Treatise 1.1.3 supplies textual as well as systematic and historical support for attributing this further, spatiotemporal criterion to Hume. This section of the *Treatise* is devoted to identifying the differences between memory and imagination. One of the differences Hume noted is that even though both faculties are limited to copying impressions, the imagination "is not restrain'd to the same *order and form* with the original impressions" (T 1.1.3.2; SBN 9, my italics). It has the ability to "transpose" its ideas, as Hume later put it (T 1.1.3.4; SBN 10). But what is the "order and form" to which the imagination is not restrained? What are the positions between which the imagination can transpose its ideas? The obvious candidates are space and time and positions in space and time. Hume claimed "*that the 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). The implication is that the imagination has the power to transpose or shuffle ideas to different positions in a spatial and a temporal order. This reading is supported by Hume's examples of the

"liberty of the imagination to transpose and change its ideas." Ideas of "winged horses, fiery dragons, and monstrous giants" are formed by spatial transposition of ideas copied from compound impressions of things like horses, birds, lizards, and fire (T 1.1.3.4; SBN 10). But what can be moved from one set of surroundings to another cannot depend for its existence on any particular set of surroundings. Being disposed at different locations in space and time suffices to establish the possibility of the separate existence of the impressions and therefore serves as a more remote criterion for the distinctness of the ideas that copy those impressions.

There may be limits to the applicability of this spatiotemporal criterion. Minimally visible and minimally tangible points are differently disposed in space. But Hume claimed that "the points, which enter into the composition of any line or surface, whether perceiv'd by the sight or touch, are so minute and so confounded with each other, that 'tis utterly impossible for the mind to compute their number" (T 1.2.4.19; SBN 45). There is some tension between this remark and Hume's claim to be able to take "the least idea I can form of a part of extension" and discover that the compound idea of extension arising from its repetition augments in proportion to how often the idea is repeated (T 1.2.2.2; SBN 29) (a claim that plays a crucial role in his rejection of infinite divisibility). And there is further tension with Hume's claim that however minute and confounded points may be, if we take the precaution of making them of vividly contrasting qualities, like blue and red, we can examine them so closely as to be able to confidently declare that they can be disposed immediately alongside one another without either overlapping or leaving any gap (T 1.2.4.6; SBN 41) (a claim that is important if we are to understand how he resolved the summation problem mentioned earlier[11]). Even if we insist on accepting Hume's claim that the points constitutive of a line or surface are too minute and confounded to be counted (T 1.2.4.19; SBN 45), what gives rise to the difficulty of counting the points is precisely that we *cannot* tell if they are differently disposed. From the fact that *absence* of a discernible difference in spatial disposition makes differentiation *impossible*, it hardly follows that the *presence* of clearly discernible differences in spatial disposition could be no criterion for distinctness, difference, differentiability, and separability. On the contrary, it is rather what we would expect if *discernible* differences in spatial disposition are a criterion for differentiation. We can still maintain that as long as it is clear that points are differently disposed—as would be the case if one were on the left side of the visual field and the other on the right side, for instance—then they must be different and distinct and distinguishable and separable.

A different sort of limitation arises when we turn from considering differently disposed points to considering points and the compounds they constitute or points and their sensible quality or sensible qualities and their particular degrees and kinds. Hume claimed that "'tis evident at first sight, that the precise length of a line is not different nor distinguishable from the line itself" (T 1.1.7.3; SBN

18). He further claimed that a figure is "neither distinguishable, nor different, nor separable" from "the body figur'd" (T 1.1.7.18; SBN 25). And he claimed that the circumstance in which all the differently colored points resemble one another (that is, in being colored in some general fashion) is neither distinguishable nor separable from the particular color of those points (T 1.1.7.7n; SBN 637). This is only what we should expect if we apply either the existential or the spatiotemporal criteria for differentiation. A line and its length cannot exist apart from one another, and the series of places constitutive of the one is identical with the series of places constitutive of the other. The same holds for a cube or a sphere and their color, as well as for this color and its particular tint, shade, and tone.

But while the length of a line is neither different nor distinguishable from the line itself, and the size or color of a cube or sphere, from the cube or sphere, the right half of the line, cube, or sphere is different and distinguishable from the left half—and the right half of the right half from the left half of the right half, and so on, down to the individual points constitutive of the line, cube, or sphere, all of which are distinct and distinguishable from one another, at least insofar as they are clearly disposed at distinct locations in space. Where characteristic kinds of spatial configuration, like lines, cubes, and spheres, are concerned, the configuration cannot exist unless enough parts exist to be configured in that manner. However, the parts can exist independently of one another and independently of participating in that particular configuration. Though the things disposed in space are all differently disposed, hence distinguishable, and hence separable from one another and from the manner in which they are disposed, the manner of disposition is not reciprocally separable from them.

This one-sided independence puts us in a position to draw a "distinction of reason" between a manner of disposition and the parts so disposed. Once we have discovered that different parts may be disposed in the same configuration, we acquire an ability to view objects "in different aspects, according to the resemblances, of which they are susceptible" (T 1.1.7.18; SBN 25). We can consider a white globe with reference to its resemblance to differently colored objects that have the same configuration or instead to differently configured objects that have the same color.

Like all distinctions of reason, this is not a true distinction. If it were, we would have the power to form an idea of a figure that has no particular color, or a color that has no particular shape or location and no particular tint, shade, or tone. Our ideas of figures and their sensible qualities are, like all our other abstract ideas, never more than particular ideas of some specific visible or tangible object disposed in some particular fashion. This particular idea is "abstract" only insofar as it is associated with a term that assists the mind in recalling any of the other members of the class of resembling objects denominated by that term.[12]

We are now in a position to better appreciate Hume's second reason for denying that we can form ideas of "a vacuum, or space, where there is nothing visible

or tangible" (T 1.2.5.1; SBN 53). We have seen that, for Hume, all things that are differently disposed in space must be capable of separate existence and so must be separately conceivable. But the manner in which things are disposed in space is not itself differently disposed from those things. Different spatial configurations, such as those of a line, globe, or cube, can exist only insofar as a sufficient number of parts are disposed so as to constitute those configurations. And those parts cannot exist without being of some particular color or tangible quality. If we accept that for Hume, as for Berkeley, we cannot conceive separately those qualities that cannot exist separately, it follows that we cannot conceive of space or extension without conceiving of *some* colored or tangible points disposed at various locations.

Michael J. Costa has chosen to focus on this argument in his defense of Hume's position on the vacuum.

> A particular idea of space, a particular arrangement of contemporaneously experienced ideas of colour or touch, does service as an abstract idea of space only insofar as it is connected to a disposition to bring to mind other particular ideas of space. There is no idea of space that is not an idea of some particular extended array of coloured or tangible points. (Costa, "Hume, Strict Identity, and Time's Vacuum," 3)

> [A]ny idea of space is a complex idea of visible/tangible points related in a certain manner to each other. The idea is an idea of the manner only insofar as it is an idea that consists of points related in that manner. (Costa, 4)

> The idea of a vacuum is purportedly the idea of a space with no content; but Hume's account of the idea of space says that any instance of space is just an arrangement of content, and that the abstract idea of space is just a particular idea of arranged content connected to a disposition to think of other arrangements of other visible or tangible content. There seem to be no resources here for explaining how we can have an idea of space without content. (Costa, 4)

Notwithstanding everything that has been said, Hume would have had the resources to explain how we can have an idea of space without content, had he cared to use them. Even granting that we can form no idea of a spatial manner of disposition where there is nothing disposed and that all our ideas of space and arrangements in space are always ideas of particular arrangements of particular visible or tangible points, it remains a question why these points could not be so disposed as to enclose or otherwise define an intermediate empty space or vacuum.

We might think that Hume could have argued as follows: Were it possible to form an idea of things disposed around an unoccupied gap or interval, then because

whatever is differently disposed in space is distinct, different, and distinguishable, it would be possible for the imagination to separate the idea of the unoccupied gap from its surroundings and thus form an idea of a space where there is nothing visible or tangible. Since it has been established that this is impossible, it must likewise be impossible to form the idea of things disposed on either side of an unoccupied gap or interval.

However, this argument is based on a mistake. It treats the empty space between the disposed elements as if it were simply another disposed element rather than a feature of the manner of disposition of the elements—something that arises from the manner in which they are disposed. The reason why it is impossible for the imagination to form an idea of a space where there is nothing visible or tangible is that the idea of space is a compound idea. It is trivial that if we remove all the components from what we are thinking, we also cease to think of any compound or any manner of disposition of those components. This trivial truth does not impose any constraints on what we can imagine when we keep the component ideas in our compound idea. A window that is filled with bricks is not a window but a wall. However, a window can be made by piling up bricks in a certain fashion. If a window is made that way, and we remove those bricks, we destroy that window. This is because, even though the window is not disposed where the bricks are, it arises from the bricks being disposed in a certain fashion, so that removing the bricks destroys that manner of disposition and so destroys the window. From this it hardly follows that bricks cannot be disposed so as to form a window.

Hume's second argument against the possibility of forming ideas of empty spaces is therefore dissatisfying. While it gives us a reason to accept that we could not form an idea of space without conceiving *some* visible or tangible objects, it does not offer a clear or compelling reason why those objects could not be imagined to be disposed around an empty space.

In the secondary literature, the argument from the impossibility of abstracting manners of disposition from the matters that are disposed has nonetheless been preferred to the argument from the non-entity of unqualified points, perhaps because of the latter's uncomfortable reliance on Hume's unpopular views on geometrical finitism.[13] But it has not been preferred in isolation. Commentators have sought to support it by appeal to claims Hume made about a blind person's experience of darkness (T 1.2.5.5; SBN 55–56 and T 1.2.5.11; SBN 57).[14] Both this way of supporting Hume's position and the argument from the non-entity of unqualified points will be considered in what follows.

2. Hume's Concessions

Hume's case against the idea of a vacuum is complicated by two concessions. One of the concessions is a concession to "vulgar and popular notions" and to

"the *Newtonian* philosophy," according to both of which "A vacuum is asserted" to actually exist in nature (T 12.5.26n; SBN 639).[15] Elsewhere, Hume was happy to claim that "[w]herever ideas are adequate representations of objects, the relations, contradictions and agreements of the ideas are all applicable to the objects" so that "whatever *appears* impossible and contradictory upon the comparison of these ideas, must be *really* impossible or contradictory" (T 1.2.2.1; SBN 29). Since "our ideas are adequate representations of the most minute parts of extension" (T 1.2.2.1; SBN 29), we might think that given that the most minute parts of extension cannot be either spaces or unqualified points, he would draw the conclusion that there can be no such thing as empty space, as he drew the conclusion that space cannot be infinitely divisible. But he did not.[16] When it came to vacua, he declared that his "intention never was to penetrate into the nature of bodies, or explain the secret causes of their operations" (T 1.2.5.26; SBN 64). In particular, he allowed that bodies might be separated from one another by an "invisible and intangible distance" that is not "always full of *body*, or of something that by an improvement of our organs, might become visible or tangible" (T 1.2.5.26n; SBN 639). His enterprise, he claimed, was only to explain "the manner in which objects affect the senses, without endeavouring to account for their real nature and operations" (T 1.2.5.25; SBN 63).

An initial problem is understanding just what Hume meant to concede when he said this. Perhaps the most natural reading is that he meant to concede that bodies that *appear* to have nothing between them might be shown by scientific research to *really* have nothing between them, rather than to be separated by some subtle matter. But this would be an ingenuous concession, because whatever Hume may have been prepared to accept regarding what exists in nature, he meant to say that no bodies ever appear to have nothing between them. It is not much of a concession to grant that *if* bodies appear to have nothing between them, *then* they might really have nothing between them when you consider the conditional to have a false antecedent.

Might Hume have instead meant to concede that a vacuum might exist in nature even though we can form no idea of it? That would still be a back-handed concession. It is not conceding very much to concede the existence of something while claiming to be unable to form any idea what that thing is. If that was Hume's position, it would have been more forthright to say that anyone who affirms the existence of a vacuum in nature could have no idea what they are talking about.

It might be better to understand Hume to have meant to concede that while there may be "invisible and intangible distances" in nature, they are somehow not the same things as empty spaces. Hume did want to draw a distinction between two kinds of distance, one visible and tangible, and so the subject matter for our impressions of space and the ideas that copy them, and the other invisible and intangible (T 1.2.5.16–18; SBN 59). Both are kinds of distance, but we might understand Hume

to have meant to say that only the former is space, whereas only the latter can be unoccupied. To substantiate this line of thought, Hume would have needed to explain what makes invisible and intangible distances different from empty spaces. It would be trivial to rest the case simply on refusing to allow the name "space" to be applied to distances that do not contain anything visible or tangible.

Hume did make inroads towards offering such an explanation by drawing a distinction between two senses in which objects may be considered to touch one another. In one sense, objects touch "when there is nothing *sensible* interpos'd betwixt them" (T 1.2.5.26n; SBN 638). In a different sense, objects touch "when their *images* strike contiguous parts of the eye, and when the hand *feels* both objects successively, without any interpos'd motion" (T 1.2.5.26n: SBN 638–39). Presumably, objects that touch in the first sense might fail to touch in the second, making room for a non-trivial distinction between senses in which objects might have no *space* between them and yet still have an invisible and intangible *distance* between them. The distance, in the latter sense, is not spatial, but as it were operational.

Unfortunately for Hume, this distinction is unsustainable. We do not see the parts of our eyes that are struck by "images" of objects. If we did have any sense of the parts of our eyes that are struck by "images," it would be by way of feeling rather than sight, and supposing we did have such feelings, it would still be a question how the impact of "images" on non-contiguous parts of the eye would feel to us. Would the non-contiguous impacts give rise to non-contiguous feelings that are felt to be non-contiguous and thus separated by an unoccupied "distance" that is not obviously distinct from an empty space? Would we, instead, have contiguous feelings due to the absence of any intermediate impacts on parts of the organ? Or would we have feelings that are not disposed in any particular fashion in space?

The example of a hand feeling objects successively without any interposed motion raises a different problem. It describes a succession of feelings in time, when the question is how tactile sensations are disposed in space. That confronts Hume with the task of explaining how the one gives rise to the other, a task he did not attempt. An appeal to impressions on contiguous parts of the hand would have been more appropriate but raises the same questions as the appeal to impacts on contiguous parts of the eye.

The problems are equally serious on the other side. Hume's reference to objects being considered to touch when there is "nothing *sensible* interpos'd betwixt them" is unacceptably vague. Does "nothing *sensible* interpos'd betwixt them" mean that they are perceived to be disposed immediately adjacently to one another? Does it mean that they are perceived to be disposed at remote positions with nothing sensible perceived to occupy any of the intermediate positions? Does it mean that they are not perceived to be disposed in any way at all? The fact that the same three alternatives also emerge on this side shows that Hume's attempt at distinguishing between different senses of "touch" has not succeeded.

We might look to Hume's claim that bodies can be "plac'd after such a manner, as to receive bodies betwixt them, without impulsion or penetration" (T 1.2.5.26n; SBN 639) for yet another means of distinguishing between invisible and intangible distance and empty space. On this account, an invisible and intangible distance would exist when bodies that have "nothing *sensible* interposed betwixt them" are so "plac'd" as to allow other visible bodies to come between them without either moving ("impulsion") or being occluded or annihilated ("penetration"). But how would that be possible? Oddly, but with implacable consistency, Hume claimed that it would have to be a total mystery. We must be baffled how such an event could occur, though, to our amazement, sense experience shows that it does in fact happen. "If the *Newtonian* philosophy be rightly understood," he claimed, "it will be found to mean no more. A vacuum is asserted: That is, bodies are said to be plac'd after such a manner, as to receive bodies betwixt them, without impulsion or penetration" (T 1.2.5.26n; SBN 639). Since "a vacuum is asserted," the bodies that are said to be placed after such a matter as to receive other bodies between them must be asserted to have nothing sensible in between them. They therefore "touch" in the first of Hume's senses of that term. Yet even though they "touch" it is evident to the senses that other bodies can come between them without pushing them to the side and without occluding or "penetrating" (i.e., annihilating) them. It is supposed to be a total mystery how this could happen. "The real nature of this position of bodies is unknown. We are only acquainted with its effects on the senses and its power of receiving body" (T 1.2.5.26n; SBN 639). As if to justify this claim, Hume went on to observe that "[n]othing is more suitable to [the Newtonian] philosophy, than a modest scepticism to a certain degree, and a fair confession of ignorance in subjects, that exceed all human capacity" (T 1.2.5.26n; SBN 639).

This way of "rightly understanding" the Newtonian philosophy is rather precarious. This is not a case like that of gravitation, where Newton granted the fact of the motion of widely separated bodies towards one another while refraining from speculating whether that motion is brought about by an intervening aether. We are at no loss to conceive how bodies can be disposed so as to permit other visible or tangible objects to come between them without being moved or occluded. We are at no loss because we *are* able to conceive them to be disposed at some distance from one another on either side of an unoccupied gap—a gap of a size greater than or equal to that of the bodies that come to be placed in between. There is nothing mysterious about this case—nothing that exceeds our capacities of comprehension—and so nothing that calls for "a modest scepticism to a certain degree, and a fair confession of ignorance in subjects, that exceed all human capacity" (T 1.2.5.26n; SBN 639). This is just not one of those subjects.[17]

The distinction between senses of "touch" that is used to suggest otherwise is strained. If all it takes for two objects to "touch" is that there is nothing to be seen or felt between them, then sounds, smells, tastes, and passions must all "touch"

one another and all other sounds, smells, tastes, and passions. We tend not to talk this way. Things that are said to "touch" in any non-metaphorical sense must be at least the sorts of things that fall within the domain of spatial betweeness relations. And for a finitist like Hume, who believed that there is not always a further point between any two given points, there is only one definition of "touch" that can be given: things touch when they are contiguous (that is, when they occupy locations that are neither coincident nor separated from one another by further locations). In this sense of "touch," there is no way that objects that touch can admit intruders without motion, occlusion, penetration, or annihilation, because there are no intermediate locations for the intruders to occupy. Allowing that the intermediate locations exist is allowing that vacuum exists.

On any non-trivial reading, therefore, Hume's concession that bodies might be separated from one another by an "invisible and intangible distance" that is not "always full of *body*, or of something that by an improvement of our organs, might become visible or tangible" (T 1.2.5.26n; SBN 639) is not clearly consistent with his rejection of the possibility of forming ideas of a vacuum. Reconciling the concession with the rejection requires explaining how invisible and intangible distance differs from empty space, and Hume's most direct comments on this matter are not up to the task. I consider what more he did to justify his position at the outset of part 3, below.

Hume's second concession is a concession to "our natural and most familiar way of thinking," which allows that "a vacuum or pure extension [is] not only intelligible to the mind, but obvious to the very senses" (T 1.2.5.10–11; SBN 57). We perceive the space between the stars in the night sky to be empty, or think we do. And nothing seems easier than to imagine the six sides of a room, to imagine all the matter within it to be annihilated, and to imagine the walls, floor, and ceiling remaining in place, so that they enclose an empty space (T 1.2.5.3; SBN 55).

The ability to imagine an evacuated room is an objection to Hume's view. The second, extraordinary concession arises in the course of his attempt to deal with it. Descartes, confronting a similar objection, had insisted that if all the matter were evacuated from within a vessel, then there would be nothing between the sides of the vessel, which is to say that they would have to be in contact (*Principles* II.18).[18] We might expect Hume to have recourse to the same maneuver, perhaps buttressed by appeal to the various senses of "touch" later introduced at T 1.2.5.26n (SBN 638–39). But Hume was leery of this response, and for good reason: it violates the separability principle. Since the interior of a room is differently located from its walls, floor, and ceiling, they are distinguishable and so separately conceivable, meaning we can imagine the sensible objects in the room to be annihilated without thereby being compelled to imagine the separately conceivable walls, floor, and ceiling to move into contact with one another—or to suddenly come to touch (in any sense of that term) where they did not do so before (T 1.2.5.3; SBN 54–55).

Having insisted that we can conceive the walls, floor, and ceiling to remain in position despite not conceiving anything between them, Hume went on to concede that we can also perceive as much. To make it perfectly clear, he wrote: "when only two luminous bodies appear to the eye, we can perceive, whether they be conjoin'd or separate; whether they be separated by a great or small distance; and if this distance varies, we can perceive its encrease or diminution, with the motion of the bodies" (T 1.2.5.10; SBN 57). This is precisely what we would expect given that he held that space is a manner in which things are disposed. If things are disposed in space, then they can as well be disposed remotely as adjacently, and if disposed remotely, disposed at a greater or lesser interval of separation. Yet Hume continued to deny that "there is here a vacuum or pure extension, not only intelligible to the mind, but obvious to the very senses" (T 1.2.5.10; SBN 57). This is a false opinion that "we . . . learn to correct by a little reflection" (T 1.2.5.11; SBN 57)!

How are we to reconcile these two claims: (1) when only two luminous bodies are present—nothing else, there is no change in the manner in which we perceive those two bodies to be disposed relative to one another, as compared to when they are perceived to be separated by intervening objects; (2) when only two luminous bodies are present, there is, nonetheless, no space, extension, or distance of any sort between them, even though there is when other bodies are present? This is not a rhetorical question. It is a question to which Hume and defenders such as Michael J. Costa, Donald Baxter, and Miren Boehm have proposed a common answer.[19] That answer, and its plausibility, remain to be examined.

3. The Mediate Perception of Invisible and Intangible Distance

I have so far examined Hume's arguments for denying that we have an idea or impression of a vacuum, and I have noted two concessions that make it very difficult for us to appreciate how he could persist in that denial. As devastating as these concessions may seem, Hume had to make them. His commitment to the separability thesis ruled out dealing with the emptied room the way Descartes had. He had to allow that the annihilation of the matter in the room could not force us to change how we conceive the walls to be located relative to one another, and once he had granted that we can conceive the walls to be distant from one another without conceiving anything between them, there would have been no point to his denying that this could be perceived as well. The only remaining question is whether apparently invisible and intangible distances are really empty or instead contain some material too subtle to be sensed, and Hume had no mind to contest that question.

There is not a lot of room for compromise between accepting, on the one hand, that the walls are conceived to be disposed in the same way in space, whether or not other points of quality are conceived to be disposed between them, and insisting,

on the other hand, that a vacuum (that is, an unoccupied distance) is inconceivable. But Hume clearly thought he had managed to do so. As with so many of Hume's other enterprises, the feat is not attempted by analysis or argument but by explanation grounded on appeal to the features of human cognitive psychology. In this case, the psychological appeal is to a distinction between immediate and mediate perception. Hume's solution is that we never *immediately* perceive unoccupied distances. We only *mediately* perceive (or, better, imagine) them, and even this is saying too much, because this mediate perception involves confusions and "fictions" that lead us to "falsely imagine" we are perceiving something we do not perceive.

To make his case, Hume began by considering the appearance of two luminous points in otherwise perfect darkness. According to Hume, the experience of darkness is one we share with the blind. The blind have no ideas of any visible object, that is, of any color, even of the color black. Their experience of darkness is no experience at all, even of blackness. Hume inferred that the experience of darkness had by a sighted person can be no different (T 1.2.5.5; SBN 57). The most either could experience in total darkness is muscle sensations arising from turning the eyes to either side, and those sensations are not visual, neither are they disposed in space.[20]

The case is the same for space as it is perceived by touch. Hume envisioned a person who experiences no tactile sensations and is in a state of weightlessness and motionlessness in total emptiness and darkness (T 1.2.5.6; SBN 56). Such a person could acquire no notion of extension. Even were the person to move their limbs, their experience would only exhibit a temporal sequence of muscle sensations, which is not the same thing as a simultaneous experience of sensations that are differently disposed in space.

Following Costa, we might worry that it is one thing to move our eyes or hands in complete darkness and another to instantaneously experience two separated luminous or tangible objects (as when two stars are seen in an instant or different bodies simultaneously touch different body parts) (Costa, 15n10). Here space is not described by eye or hand motions but is, instead, perceived by instantaneously perceiving the widely separated disposition of the different visual or tangible sensations. This is precisely what we would expect given the view that space is a manner of disposition of impressions and ideas. It is the spatial manner of disposition that we are supposed to be perceiving, not the temporal. The impressions and ideas ought to be perceived in an instant as disposed at separate locations. No recourse to eye or hand motions should be necessary.

Nonetheless, Hume rejected this possibility as well. According to him, though the supposition that we instantaneously perceive sensations to be disposed on either side of a gap is "natural and familiar," this "way of thinking" is "incorrect" (T 1.2.5.11; SBN 57). This is supposed to be the case because if the experience of

a perfect negation of light and color is incapable of giving the blind any idea of extension, then that same experience, when disposed between two visible objects, should not be able to do any more for the sighted. An appeal to the non-entity of unqualified points would lead to the same conclusion.

Hume maintained that the perception of the separation between two luminous bodies on an otherwise dark field arises from a rather different cause than an immediate perception of a remote manner of disposition. When only two luminous bodies are presented to the eye, and we evidently "perceive" whether they are conjoined or separate, or separated by a greater or lesser interval, or moving closer or further away from one another, our "perception" of this manner of disposition is, for all its evidence, not direct and immediate. It is mediate and the effect of custom, learning, and association. We are seduced by certain resemblances to project the idea of disposition at more or less widely separated locations onto a context where it does not actually exist. This leads us to confuse the actual appearance with the imagined one, and thereby to "falsely imagine we can form such an idea" as that of an empty space or a vacuum (T 1.2.5.14; SBN 58).

In somewhat more detail, the experience we have when we look at two stars separated by utter darkness shares certain resemblances as well as certain causal features with the experience that we have when we look at two steeple points separated by the blue of the sky. The parts of the eye that are affected by the points can be the same in both cases. The motion required to shift the focal point of the eyes from the one point to the other can be the same in both cases. Any object that can be interposed between the one set of points without causing any motion or occlusion of the points can be discovered to fit between the other without motion or occlusion. And qualities such as the loudness of sound or degree of heat alter in the same way as we move from the one point to the other. Something similar can be imagined for the case of tangible points. These affinities lead us to associate the experience of the isolated luminous or tangible points with the experience of points separated by other visible or tangible ones. And because in the one case we really do perceive an intermediate extension between the two points, we imagine, on the ground of the affinity in other respects, that there must be an intermediate extension in the other case as well. As Hume later noted: "[W]hen objects are united by any relation, we have a strong propensity to add some new relation to them, in order to compleat the union" (T 1.4.5.12; SBN 237). (For other instances of this operation see T 1.4.2.22; SBN 198 and T 1.2.4.24; SBN 48). Having discovered the other affinities between the cases in this circumstance, we "complete the union" by supposing that both are experiences of some distance or space between the points.[21]

In imagining (not perceiving) the luminous points to be set at some distance from one another, we imagine them to be separated by intermediate colored points. But because we perceive no such things, our experience exhibits a kind of

contradiction.[22] We imagine colored points to be disposed between the luminous points. But we see no such thing. To evade this contradiction we partially reverse ourselves and declare that the colored points we imagine to be there are not really there, while declaring (not successfully imagining) that the distance they take up *is* really there. When we do this, we *infer*, rather than sense or imagine, that there must be an "invisible and intangible" distance between the points. We do this only because we are tempted to imagine a *visible* or *tangible* distance to exist between the points on account of the affinities mentioned earlier, not because we *perceive* an *invisible* and *intangible* distance. We cannot even so much as conceive what we mean by the words "invisible and intangible distance." Just as all abstract ideas are really particular ones taken to stand for a whole class, so all ideas of purportedly invisible and intangible distances are really ideas of visible and tangible distances. We have no impression or idea, simple or complex, of the invisible or intangible distance we take our ideas of visible or tangible distances to represent. Our views to the contrary are the result of confusion.

I have not said anything new here. This is the view of how Hume reconciled his concessions with his theory that has been presented by Costa ("Hume, Strict Identity, and Time's Vacuum," 5–6 and 7–8) and Baxter ("Hume's Theory," 139–41). This is how Frasca-Spada reads Hume (Frasca-Spada, *Space and Self*, 180–81), though her account is supplemented with a story about how the process of applying abstract ideas engenders the use of the ultimately meaningless term "vacuum" (Frasca-Spada, 183–88) and the claim that what Hume found most interesting about the topic of the vacuum is what it tells us about human nature (Frasca-Spada, 188–93). Boehm differs from them only in placing greater emphasis on the prior point that "what is present to the senses" contains nothing that could be considered to be a "distance" in any sense (Boehm, "Filling the Gaps," 66–87), even though "the perceivers' reaction to what is present to the senses" invests that experience with an imaginary or fictitious distance (Boehm, 85).

With this theory in hand, Hume could make some claim to have reconciled his extraordinary concessions with the tenet that we can form no idea of a vacuum. He could claim that when natural scientists and the vulgar affirm the existence of an invisible and intangible distance between objects, they never directly perceive or even clearly conceive such a distance. Bodies that have nothing visible or tangible between them can only be perceived or imagined to touch. When experience teaches us that some of these touching bodies are nonetheless somehow capable of allowing other bodies to come between them without being penetrated or pushed to the side, that same experience leads us to associate them with others that are separated by a number of visible or tangible points. This association might lead the vulgar to *infer* that the apparently touching bodies are in fact separated by an invisible or intangible distance and even to declare that they perceive such a distance. But this perception is only mediate, and it is, moreover, confused because the

image that is formed of the invisible or intangible distance can never be anything other than an image of an appropriate number of intervening quality points, if only points of the quality "body temperature" or the quality "black" (which here must be considered to be a color like any other and not an experience of darkness like that had by the blind). Natural scientists may maintain that the imagined quality points are the equivalent of Cartesian materially false ideas, which do not correspond to any actually existing object. But that would be moot, because Hume never meant to take a stand on what exists in nature, but only on what exists in our perceptual fields.

Similarly, when we claim that the walls of the evacuated room would have to remain separate, we do so because we imagine them to continue to affect our eyes in the same way they did when separated by color points. This leads us to associate this imagined experience with the image of the walls separated by color points. As a consequence, we naturally *infer* that the walls of the evacuated room are separated by an equal number of points, which must, however, be invisible. We may even declare that we imagine such a distance. But we imagine more than we think. As Hume put it, "we falsly imagine that we can form such an idea" (T 1.2.5.14; SBN 58). The idea we form can never be adequate to the terms in which we define it. It can only ever be an idea of the original, unemptied room, or of the room with its contents replaced with some other contents, such as a quantity of points colored "black" in the particular sense specified earlier.

It remains to consider whether this theory can stand up to criticism. As a preliminary, I further amplify an aspect of Hume's account that has been emphasized by Boehm.

4. The Failure of Hume's Account of Mediate Perception

Hume's account of the origin of the idea of empty space might be described as a developmental hypothesis. It is a hypothesis of the sort used by Berkeley to explain the perception of visual depth. As Berkeley thought that depth is not immediately or originally perceived by vision but is only something we learn to see as a consequence of coming to associate visual cues with tangible depth, so Hume thought that a vacuum is not immediately or originally perceived by either vision or touch but is only something we learn to see as a consequence of coming to associate visual and tangible cues with experiences of bodies separated by other sensible objects. Like Berkeley's account, Hume's can be illustrated by appeal to what Margaret Atherton has called the "Molyneux man."[23] Hume's account entails that a previously blind person who is newly made to see and presented with two luminous points in otherwise total darkness should not see distance of any sort between those points. That is something the person could only manage to do after learning to associate the features of this case with other cases where there

are colored points intervening between the two given points. After all, by Hume's own account, the darkness between the points conveys no idea of distance, not even "invisible" distance, otherwise the blind would have such an idea. Indeed, according to the argument from the non-entity of unqualified points, there simply is nothing between the two given points in this case. The "fictitious" idea of an "invisible and intangible distance" between the points is only aroused by non-spatial similarities with other cases where there really is a particular visible distance. And the newly sighted person has not yet discovered those similarities.

Boehm has rightly insisted on this consequence, writing that "if there is no *distance* in the total darkness case, then there is no distance in the case of the luminous bodies separated by darkness either, at least when we consider only 'the objects themselves' [i.e., what is present to the senses as opposed to perceivers' reactions to that presence]" (Boehm, 85) and that "*distance* makes its appearance" only when we begin to consider "other differences in 'the manner [the objects themselves] affect our senses'" (Boehm, 85–86).

But Boehm does not take things as far as they need to be taken. Granting that the newly sighted person does not experience the two luminous points in the midst of utter darkness to be distant from one another, we need to ask how the person does experience those points. Does the person experience them to be contiguous? Or does the person not experience them to be disposed in space at all, like the olive and fig tastes of *Treatise* 1.4.5.11–13, which only come to be ascribed a location in space after we have learned to associate their experiences with other experiences (T 1.4.5.11–13; SBN 236–38)? In what follows I argue that neither option will serve Hume's purposes.

According to Hume's theory we come to see two luminous points as disposed on either side of an interval of darkness because we learn to associate the experience of such luminous objects with an experience of objects disposed on either side of an intervening visible object. This means that the newly sighted person must at least experience points on a fully colored visual field to be spatially disposed. Unless the fully colored experience provides newly sighted persons with some experience of distantly disposed points, they would never be able to learn to associate the two luminous points with distantly disposed points or be led to "falsly imagine" (T 1.2.5.14; SBN 58) that they are disposed on either side of an invisible or intangible distance.

The next question that arises is how the newly sighted person comes to experience points on a fully colored visual field to be spatially disposed. Two options suggest themselves. One might be called the "intuitionist" option. According to it, colored points are originally given as disposed in space in compound impressions, and the newly sighted person directly and immediately experiences that manner of disposition in having the compound impression. Just as nothing more is required to perceive red than having a simple impression of a red point, nothing

more is required to perceive a red point to the left of a blue point than having a compound impression consisting of a red point disposed to the left of a blue point.

The second option might be called the "constructivist" option. According to it, the newly sighted person's experience of a fully colored visual field is, at most, an experience of multiple colored points (and perhaps even less than that if the points are all of the same color). Further mental activity is required to work that raw experience into a thought of those points as disposed at various locations on a visual field.

As a matter of fact, no early modern figure was able to establish a thoroughly constructivist account of space cognition. All ended up either tacitly or explicitly relying on the notion that at least some spatial relations—notably relations of relative location on the two-dimensional visual field and relations of relative location on the tactile body map—are directly and immediately perceived.[24] Hume was not only no exception, he was explicitly an intuitionist about space perception.[25] He *attempted* (unsuccessfully as it turns out) to offer a constructivist account of the cognition of spatial relations on visual fields containing regions of utter darkness. He made no such attempt to account for the cognition of spatial relations on fully colored visual fields.

Hume's normal practice when invoking complex ideas that are not simply copied from antecedent complex impressions was to offer an account of the original impressions and the operations leading the imagination to form the complex idea. This is what he did with golden mountains, the "New Jerusalem," absolute equality, necessary connection, identity, unperceived existence, fear, hope, and the indirect passions, justice, and invisible intelligent powers. There is no such account on offer for localization on the fully colored two-dimensional visual field or for localization on the fully occupied three-dimensional body map. The story of the diminishing ink spot (T 1.2.2.4, SBN 27–28) is told to convince us that impressions cannot be diminished beyond a certain limit. It does nothing to explain what would lead us to locate the ink spot at the center of the visual field as opposed to the periphery or on the left side as opposed to the upper side. The story of the whirling coal is even less pertinent.

Hume claimed that points of the same color are "confounded" (T 1.2.4.19; SBN 45). But this only applies to points of the same color (T 1.2.4.6; SBN 41) and only when those points are disposed in such close proximity to one another as to make it difficult to determine whether they are separate or coincident. It does not entail that points of different colors will ever be confounded or that points of the same color are never disposed at distances at which they are not confounded. It does not, therefore, create the conditions that would mandate a constructivist account of spatial localization.

It might be objected that Hume's account of how eye motions and other affinities lead us to falsely imagine that we perceive distance in utter darkness cases

could be applied to lay the foundations for a constructivist account of how we perceive spatial distance in all cases. But as originally presented, Hume's account only claims that we associate something that is not truly a spatial, invisible and intangible distance with something that is a visible and tangible distance. Expanding the account to explain the perception of visible and tangible distance as well raises the question of what originally gives us the idea of spatial distance. Eye motions only give us temporally successive feelings. Other cues, such as sensations specific to the part of the eye that is affected, if they are not directly and immediately experienced as disposed in space to start with, would be only qualitatively distinct. But no combination of sensations that are just qualitatively distinct and distant in time can give rise to the idea of a distance that is not successive or qualitative but simultaneous and that occurs over not one but exactly two spatial dimensions exhibiting the radically unique character of left/right and up/down.[26] For this to happen would be for ideas of relations to arise from impressions that contain nothing adequate to produce those ideas.

Hume did consider us to be able to form ideas of "philosophical" relations when, upon "the arbitrary union of two ideas in the fancy," we note some "circumstance" in which they can be compared (T 1.1.5.1; SBN 13). But if two ideas are only qualitatively distinct and successive in time, then there is no "circumstance" of disposition over two spatial dimensions in virtue of which they can be compared to discover philosophical relations of contiguity and distance in space. Ideas of contiguity and distance in space are among the philosophical relations Hume enumerated (T 1.1.5.3; SBN 14), but, like all philosophical relations, they arise from noting something already present in the relata that is brought to the fore by the act of comparison. The philosophical relations of contiguity and distance in space and time presuppose some prior experience of contiguity and distance in impressions and ideas to serve as a circumstance of comparison.

Of course, Hume further considered our ideas of contiguity and distance in space to be "natural" relations, arising from reflection on one of the manners in which the imagination associates ideas (T 1.1.5.1; SBN 13). As such they have an innate or instinctive basis. But we can only form ideas of a natural relation, such as contiguity or distance in space, insofar as we experience ourselves associating perceptions on that basis, and all association is based on past experience. To associate a picture of Caesar with Caesar I must have earlier seen Caesar some other way; otherwise the resemblance of the picture to its model will not lead me to think of the model. To associate the doorway with what lies behind the doorway, I must have earlier been positioned behind the doorway to see what lies contiguous to it. If impressions are not given as directly and immediately contiguous over two dimensions in space to begin with, they can only be "naturally related" or associated on the basis of qualitative resemblance or difference, or temporal contiguity or distance, and no such association can produce ideas of distance up and down

or distance to the left and the right. If qualitative differences and eye motions are what lead us to falsely imagine luminous points viewed in utter darkness to be distant from one another, then when we are not confronted by utter darkness, and are moving our eyes around and feeling their various parts to be affected, we need to directly perceive spatial distances on the fully colored visual field. That puts us in a position to associate the eye motions and the feelings of the affected parts of the eye with those spatial distances. Otherwise, all we would be able to do is associate eye motions with eye motions and affected parts of the eye with affected parts of the eye. And those associations can only lead us to think of relations of quality and of contiguity and distance in time, leaving it a mystery how any idea of a spatial disposition of impressions could arise. To sum up, association is not creation: it only connects us with what we have experienced before; it cannot produce something entirely new. An idea of spatial relations cannot arise from entirely a-spatial experiences by association. As Hume noted when offering his skeptical critique of causal realism (T 1.4.2.47; SBN 212), it is only possible to offer an associationist account of a phenomenon when both of the associated phenomena have been given in past experience. We cannot associate eye motions or other cues with spatial positions or distances unless we concomitantly experience spatial positions and distances.

A second reason for accepting that Hume was an intuitionist about space perception is that he not only failed to provide a constructivist account of localization on the two-dimensional visual field or the three-dimensional body map, he explicitly affirmed an intuitionist account. Hume declared that "[t]he table before me is alone sufficient by its view to give me the idea of extension" (T 1.2.3.1; SBN 34). Since the idea of extension is the idea of visible or tangible points disposed in a certain fashion, the implication is that all I need to do is look at the table in order to directly and immediately receive impressions of colored points disposed at various locations on a visual field. This is not a "Molyneux" case, where the newly sighted viewer is supposed to see only purple points in no particular manner of disposition. Making no reference to any process of division or discrimination that might be required to eliminate the "confusion" of points or determine how they are disposed, Hume continued,

> This idea, then, is borrow'd from, and represents some impression, which this moment appears to the senses. But my senses convey to me only the impressions of colour'd points, dispos'd in a certain manner. If the eye is sensible of any thing farther, I desire it may be pointed out to me. But if it be impossible to show any thing farther, we may conclude with certainty, that the idea of extension is nothing but a copy of these colour'd points, and of the manner of their appearance. (T 1.2.3.1; SBN 34)

To say that the idea of extension is "nothing but a copy" of the "manner of appearance" of the impression that "this moment" appears to the senses is to say that the idea of extension is not among those complex ideas that are fictively generated by some process of the imagination—a process that could be expected to take some time. It is, rather, among those complex ideas that are simply copied from what is directly and immediately given in compound impressions. Even the fact that the colored points are all homogenously purple gave Hume no pause. When the ordered elements are all identical, it raises a question of what could possibly lead the imagination to assign them to one location in space rather than another. Why consider them to make a rectangular table rather than a square or a round one or, for that matter, a collection of purple stars? The only ones who can afford to have no concern for this question are those who assume the points to be originally given in their order in compound impressions so that no subsequent arrangement is necessary.

On Hume's account, the newly sighted person must, therefore, have two radically different kinds of visual experience: visual experiences containing utter darkness, which exhibit colored points that are not disposed in any fashion whatsoever or that are only contiguously disposed, and visual experiences of fully colored fields, which exhibit the luminous points as separated by other colored points. Since reflections on the experience of the newly sighted person are thought experiments designed to draw our attention to what we all immediately perceive, the same must be true of everyone's immediate visual experience. We all have two radically different kinds of visual experience, which those of us who are not visually impaired have learned from infancy to associate and can now no longer discriminate, because the former are immediately altered by judgments that have become so customary as to become irresistible. Let us continue to call the former sort of experiences "utter darkness" experiences (though, to be clear, the utter darkness is only between luminous points, not everywhere on the visual field), and the latter sort "fully colored" experiences.

I now proceed to argue that the association of these two sorts of experience is impossible by any of the means Hume or such commentators as Costa, Baxter, and Boehm have identified. To the extent that it appears otherwise, it is only because Hume and his commentators have tacitly assumed the very thing that Boehm has rightly stressed that a defender of Hume cannot assume—that there is a real and an immediately perceived spatial distance (that is, an intervening empty space) between the luminous points in utter darkness experiences.

Some passages from Boehm's attempt to address this issue will serve to illustrate the sort of problem I mean to bring up. Boehm writes,

> consider the difference in the movements of the eyes in the case of total darkness or blindness and in the case of the luminous bodies separated

> by darkness. In the first case, there is nothing in the objects themselves that guides or influences the movement of the eyes. One moves the eyes randomly, as it were. . . . But in the case of the luminous bodies, their relative position "guides" the movement of the eyes. (Boehm, 86)

What is the "relative position" that plays the guiding role here? If the luminous bodies are disposed a certain distance apart from one another at either side of an empty space, then we can understand how motion of the eyes to bring the center of vision from the one to the other would be guided to be motion of just a certain sort. But if there is no intervening distance in utter darkness cases, as Boehm maintains (Boehm, 90–92), then it is far from obvious what could guide the eye motion to be of one sort rather than another (as they would need to be if they are to give rise to ideas of a greater or lesser distance) or to feel one way rather than another. But, beyond the passage I have just quoted, Boehm has nothing more to say about how what is simultaneously presented on the visual field might serve to guide motion. Boehm, instead, turns to consider what is only successively presented in tactile experience.

> It is this *guided* sensation of motion [arising "when one moves one's hand along a smooth table"] that allows us to judge of the (real) distance. The case of interrupted tangible experience shares the feature that the movement of the hand is also *guided* in a way by the tangible. If it is something horizontal that one is touching, upon being interrupted, one would continue to move one's hand in a horizontal direction, expecting to find something in the same horizontal line as the previous object or tangible sensation. And here too then, the "guided" motion of the hand would allow us to judge of distance. (Boehm, 87)

Boehm takes Hume to have maintained that vacua are no more real than they are perceived (Boehm, 90–92), which would mean that in the "interrupted" case the tangible points could not in fact be disposed at either side of an empty space. There is no such thing for them to be disposed at either end of. But if the tangible points are not so disposed in what is called the interrupted case, then it is not clear how there could be such a thing as an interrupted case, where one has what is described as the experience of moving one's hand in a "horizontal direction," or a "horizontal line," without encountering anything. This sort of experience is possible only if there really is some space between the tangible points. It is also unclear what would constitute "continuing to move one's hand in a horizontal direction" or finding "something in the same horizontal line" for a being who perceives nothing, not even a distance, between two tangible points.

Again, Boehm writes,

> Compare the following: observing someone making a pizza and observing a very good pantomime of someone making a pizza. All the movements are the same: the mixing of the ingredients, the rolling of the dough, the throwing the dough in the air. . . . Of course, in the case of the pantomime, there is nothing there to mix or roll or throw. . . . But the movements are identical in the two cases, and so we describe both cases in the same way: rolling the dough, even when there is no dough. . . . Note that we can "judge of the pizza" in the pantomime case, we can even judge the size of the pizza, without there being a pizza at all. Although there is no pizza, it is true that the pantomimist is making a pizza, and it is false that she is making a donut. And just as there is no pizza in the pantomime case, there is no distance in the case of the invisible and intangible distance. (Boehm, 88)

Of course this is just an example. But one would have hoped that the example would be apt, and this one is not. The example is supposed to illustrate how someone who experiences no distance of any sort between two points could nonetheless come to judge that the points are separated by a greater or lesser "invisible or intangible distance." But the pantomime artist moves in space. The artist's hands are seen to be more or less far away from one another. If we suppose an illuminated pantomimist working in utter darkness, then, according to Boehm, we should perceive no distance of any kind between the artist's hands. And then, there really would be no saying what size the pizza is, or whether what is being made is a pizza or a donut. The challenge is to come up with an example of something that does not involve things that are tacitly supposed to be remotely disposed in space but that will, nonetheless, lead the observer to judge that certain spatial distances and relations obtain. Boehm's only response to the challenge is the inadequate story about points that are not perceived as being at any distance from one another despite guiding eye and hand motions.

In fairness, Boehm at least attempts to explain how the newly sighted person might be led to associate utterly dark and fully colored experiences. Others have simply listed the similarities Hume identified—eye motions, feelings in the affected parts of the eyes, the ability to accept interlopers, and degradation of quality—as if it were obvious that they are adequate to establish an association. In what follows, I make a more general case that they are not.

On Hume's account and the accounts of such commentators as Costa, Baxter, and Boehm, the association of utterly dark with fully colored experiences is the product of two sorts of similarities: causal similarities (for example, an ability to accept interlopers or a degradation of quality) and resemblances. Of the two grounds of association, the latter must be more fundamental. The former can only have an ancillary role to play in further strengthening a disposition to

unify experiences that has already been established on the latter basis. This is because we need to have some way of telling whether we are having the same utter darkness experience from one moment to the next. Experienced perceivers know that luminous points can move around in darkness. But the newly sighted perceiver, who either does not see the luminous points in darkness as disposed in any particular fashion whatsoever or takes them to be contiguous, cannot tell the difference when the only change on the visual field is due to motion. All that the newly sighted perceiver is immediately able to perceive is the number of points and their color. And motion does not change that. As a consequence, for the newly sighted perceiver, utter darkness experiences that seem the same because they contain the same numbers of points of each color will not always exhibit the same causal features, because the points are, in fact, differently disposed as a consequence of motion, though the newly sighted perceiver cannot yet perceive this. Objects that fit between points in one utter darkness experience will not fit in another, apparently identical utter darkness experience. Properties like scent and loudness will not degrade in the same way from one point to the other, and so on. Consequently, these sorts of causal resemblances will not be independently discoverable. Learning them requires that utterly dark and fully colored experiences have already been associated with one another on some other basis. Given that prior association, the causal similarities between the cases can be discovered and can serve to further strengthen the association. But they cannot establish an association independently.

We must, therefore, fall back on qualitative resemblances as foundational for Hume's account of how we come to learn to perceive points as spatially disposed in darkness. Hume identified two of these: "the motion that is requir'd in the eye, in its passage from one [point] to the other," and "the different parts of the organs, which are affected by [the points]" (T 1.2.5.12; SBN 58). The 1739 edition of the first two books of the *Treatise* includes a passage adding "the angles, which the rays of light flowing from them, form with each other," but Hume quickly thought better of that and desired, as mentioned in the appendix to the 1740 edition of the third book, that this passage be struck out on the ground that "these angles are not known to the mind, and consequently can never discover the distance" (T Appendix 22; SBN 636). But the same could be said of the two other features Hume identified. A perception of the part of the eye affected by a light ray would have to be either a perception of vision or a perception of touch. But we do not see the part of the eye affected by a light ray any more than we see the light ray or the eye itself. Maintaining that we instead feel the parts of the eye that are touched by light rays tacitly invokes the view Hume wanted to dismiss in another way. If we feel the parts to be disposed at some distance from one another despite not feeling any other light rays touching any of the intervening parts, then we experience a vacuum between our tactile sensations of eye parts. If, on

the other hand, the parts of the eye that are touched by light rays do not produce differently disposed feelings but only qualitatively different feelings (referred to as "local signs" by later, nineteenth-century constructivists), then I ought to be able to say something about these qualities: for example, whether they are all of the same kind and differ only in intensity, like heat and cold; whether they differ over two or more dimensions of intensity, like sounds; whether they are different and unrelated, like tastes; or whether they are different but shade off into one another, like colors. The fact that I cannot choose between these options suggests that I have no such tactile impressions.

This leaves Hume's appeal to "the motion that is requir'd in the eye, in its passage from one [point] to the other" (T 1.2.5.12; SBN 58) as the sole possible perception that might forge a link between utterly dark and fully colored experiences. One problem with this alternative is that it only gains traction by presupposing the very view it means to replace. To see why, ask what would guide the eye motion in the utter darkness case. It is tempting to suppose that the two luminous points are placed at some distance from one another on an otherwise dark visual field, and the motion is guided by the effort to move the center of the visual field from the one point to the other. But this is to suppose that the one point is seen to be disposed at some distance from the other, albeit a distance not occupied by any intervening points. And that is tantamount to accepting that a vacuum is immediately perceived to lie between the points. In the utterly dark case, the visible points are either not disposed in any particular fashion or are contiguously disposed. If they are not disposed in any particular fashion, they cannot guide an eye motion of any particular sort. If they are contiguously disposed, they can only guide a uniformly minimal eye motion, leaving it a mystery how we could come to think that the luminous points might be separated by a greater or a lesser distance. The most that an eye motion could do in the utterly dark case is cause some points to disappear and others to appear. Supposing no spatial order among the points, the appearances and disappearances would seem random. Supposing they are all experienced to be contiguous, the disappearances would occur on one side, and the appearances on the opposite side. It is not clear how any of that would lead us to associate what we experience in the utterly dark case with what we experience in the fully colored case.

Another problem is that, on a clear dark night, there are many stars in the sky. Yet we perceive their order at first glance, with no time at all taken to perform the multiple eye motions that would be required to gauge the distance between all of them, and with nothing more than a slight eye tremor visible to an observer who is watching us do it.

These weaknesses pale in comparison to a final problem. Hume's theory is presented only as a theory of how we come to localize color points in utter darkness cases. In fully colored cases an entirely different theory is on offer. In those

cases, we directly and immediately perceive how the colored points are disposed. No recourse to eye motions or local signs or causal relations is required. The points are, instead, immediately given as spatially ordered in a compound impression, the points being the simple components of the compound, and the spatial order, the manner in which they are disposed in the compound. But now suppose we are looking in bright daylight at a panorama of colored points and, for whatever reason, a single point anywhere on this visual field fades out and is replaced by a point of darkness. Then, according to Hume's theory, the entire character of the immediate visual experience changes radically. Where before we directly and immediately perceived how each of the colored points is disposed relative to the others, now an order for the points must be mediately perceived by eye motions (a rather large job considering that on a visual field 180° wide and 100° high there would be almost eighty thousand points, minus the one that has faded to darkness).

Hume really does have no alternative here, for to suppose that we continue to immediately perceive how all the remaining points are disposed relative to one another would be to accept either that we immediately perceive them to be disposed around an unoccupied gap, or vacuum, or that we immediately perceive the surrounding points to move to touch one another in line with the Cartesian answer but in opposition to the separability thesis. However, to accept that the disappearance of a single colored point from a single location on the visual field radically changes the nature of our experience of the manner of disposition of the remaining points, even on parts of the visual field that are far removed from the location where the point disappears, is to violate the separability thesis in an even more flagrant fashion. Points on the left side of the visual field can be perceived without perceiving those on the right side, as demonstrated by moving one's eyes to the left. They should, therefore, be separately conceivable, given the understanding of the separability thesis articulated in part 1 above. The disappearance of a point on the right side should not affect how we conceive points on the left side. In particular, it should not affect how or, more fundamentally, whether we immediately perceive them to be disposed in space or need to determine their spatial order by means of eye motions. By the same token, the points surrounding a given point are distinguishable from that point. They ought, therefore, to be separately conceivable from that point. The disappearance of that point should not affect how or whether we conceive them to be disposed relative to one another. Hume hesitated to maintain this when considering the case of the evacuated room. He would have had just as much reason to reject the consequence in this context.

Hume's account of how we come to "falsly imagine that we have an idea of vacuum" is therefore unsustainable on his own principles.

5. A Humean Defense of the Idea of a Vacuum

Hume's principles ought to have led him to affirm that we can form ideas of vacua and so, consistently with his claim that "nothing of which we can form a clear and distinct idea is absurd and impossible" T 1.1.7.6 (SBN 19–20), that vacua must be at least possible. The two arguments he offered to the contrary are ineffective. The first argument, the argument from the non-entity of unqualified points, is a non-sequitur. A point that lacks all extension and that lacks any visible or tangible quality still has a feature that makes it something rather than nothing, namely, a location relative to other points. Hume could insist that at least some of these other points need to have something more to them to make them real, on pain of an infinite regress.[27] But granting this does not rule out the possibility of vacua interspersed between these landmark bodies. Hume's second argument, the argument from the impossibility of forming an idea of a manner of disposition where there is nothing to be disposed, has already been shown to be inadequate to rule out the perception of vacua between perceived bodies. (Recall the earlier example of bricks and a window.)

Hume's subsequent appeal to the experience of darkness had by the blind is also inadequate. We can grant that just as the experience of darkness had by the blind gives them no idea of space or distance or extension, so it gives us no idea of space or distance or extension. But from this it does not follow that we cannot perceive an empty space between two stars in the otherwise total blackness of the night sky. We perceive the empty space between the two stars by perceiving something the blind cannot perceive: the stars on either side of it and the remote, as opposed to proximate, manner of disposition of those stars. The idea of empty space is a compound idea arising from the idea of visible or tangible objects disposed at some distance from one another. The blind receive no ideas of extension from vision because they cannot perceive the surrounding visible objects, which are components that are necessary for the compound idea of extension to arise. The sighted are not similarly challenged.

Hume's account of space and time as compounded from indivisible points disposed in a certain manner ought to have led him to recognize that points might be remotely as well as proximately disposed. At the outset of this paper, I made passing reference to the summation problem, the problem of how space could arise from the addition of parts that lack any extension. Hume had no interest in this problem because his account of space as a manner of disposition implicitly addresses it. For Hume, space is not simply the product of the addition or composition of its parts. It is crucial that the parts be disposed in a certain fashion. And experience tells us that this manner of disposition is discrete: there is not always a further location between any two given locations at which a further visible or tangible point may be disposed. As Hume said, "A blue and a red point may

surely lie contiguous without any penetration or annihilation" (T 1.2.4.6; SBN 41). "Contiguous" here means without any intervening gap. "Without penetration or annihilation" means without any overlap or coincidence, which for points would have to involve the destruction of the one or the other, on pain of having two bodies in the same place at the same time or "penetration." The combination of the two means that the spatial manner of disposition is characterized by an immediate adjacency relation. Because this relation governs the spatial manner of disposition, unextended points may be disposed alongside one another in such a way as to compose an extended whole—a whole that increases in extension as points are added to adjacent locations.

Hume argued that the extension of the whole does not arise as a consequence of the extension of the parts but, instead, as a consequence of their manner of disposition:

> I first take the least idea I can form of a part of extension, and being certain that there is nothing more minute than this idea, I conclude, that whatever I discover by its means must be a real quality of extension. I then repeat this idea once, twice, thrice, *&c.* and find the compound idea of extension, arising from its repetition, always to augment, and become double, triple, quadruple, *&c.* till at last it swells up to a considerable bulk, greater or smaller, in proportion as I repeat more or less the same idea. (T 1.2.2.2; SBN 29)[28]

Since the ideas that are being added have no extension, no addition of any number of them will produce an extension, on the supposition that the extension of the whole is the product of the extension of the parts. But on the supposition that the extension of the whole is a product, not of the extension of the parts, but of their manner of disposition, and the further supposition that the manner of disposition is discrete and will not always allow a further point to be disposed between given points, the continual augmentation must occur, notwithstanding the extensionlessness of the parts.

But, having drawn this brilliant inference, Hume failed to follow through with it when the time came to consider our perception and conception of empty space. If the magnitude of a space is not a consequence of the magnitude of its parts but of their manner of disposition, it should not make any difference whether the points between any two remotely disposed visible or tangible objects are points of some "real" visible or tangible quality or are instead unoccupied locations. Even in the case of immediately adjacent points, it is the manner of disposition alone that establishes a separation and prevents the points from being coincident. The manner of disposition is likewise the only source to which we can turn to account for more remote separation, not the presence or absence of intervening points. If

the manner of disposition were not alone sufficient to establish such a separation, supposing the intervening points to be points of some "real" visible or tangible quality would do nothing to repair the lack, since whether the intermediate points are qualified or unoccupied, they are unextended and so can do nothing to wedge the endpoints apart from one another.

This is not to say that we can form ideas of absolutely empty space. The reasons why we cannot were given at the close of part 1 above. "The ideas of some objects [the mind] certainly must have," Hume wrote (T 1.2.3.10), and we can grant him that and allow that where there are no objects to be disposed, there can be no manner of disposition. But given some visible or tangible objects to be disposed, there is nothing to say that there must be further objects disposed at every available location.

We might well ask why Hume would have been so concerned to deny that we have impressions and ideas of vacua, given that he had no good argument for doing so, given that the claim is in tension with his separability principle, and given that his definition of space as a manner of disposition does more to establish the opposite. One of Hume's principal reasons for skepticism about the existence of unperceived objects is the "Berkeleian" argument that ideas of the "primary" qualities of extension, solidity, and their modes cannot be conceived apart from ideas of the sensible qualities (T 1.4.4; SBN 225–31 and EHU 12.15; SBN 154–55). Hume might have thought that allowing that we can form ideas of vacua would threaten that argument. The threat is not real.[29] But it is apparent, and Hume may have been tripped up by that. This would not be the only instance where an eagerness to advance skeptical paradoxes induced him to leap to unwarranted conclusions.

NOTES

An earlier version of this paper was presented in Clermont-Ferrand in March, 2013 at the conference "Quantity, Quality, Degree: Concepts of Intensive and Extensive Magnitude," organized by Laura Berchielli and Sébastien Gandon. Thanks to Professor Berchielli for inviting me to participate and inspiring me to think about this subject. Thanks also to two anonymous referees for *Hume Studies*.

1 References to the *Treatise* are to David Hume, *A Treatise of Human Nature*, ed. David Fate Norton and Mary J. Norton (New York: Oxford University Press, 2007), hereafter cited in the text as "T" followed by Book, part, section, and paragraph numbers, and to *A Treatise of Human Nature*, ed. L. A. Selby-Bigge, revised by P. H. Nidditch, 2nd ed. (Oxford: Clarendon Press, 1978), hereafter cited in the text as "SBN" followed by page number.

2 Scholarly assessments of this carefully nuanced position have tended to be positive. Even as harsh a critic of Hume's views on space as C. D. Broad found little to disagree

with in Hume's views on the idea of vacuum ("Hume's Doctrine of Space," *Proceedings of the British Academy* 47 (1961): 161–76, esp. 172–76). More recent assessments have been similarly positive. See Michael J. Costa, "Hume, Strict Identity, and Time's Vacuum," *Hume Studies* 16 (1990): 1–16; Marina Frasca-Spada, *Space and Self in Hume's* Treatise (Cambridge: Cambridge University Press, 1998), 178–93; Donald Baxter, "Hume's Theory of Space and Time in its Skeptical Context," in *The Cambridge Companion to Hume*, ed. David Fate Norton and Jacqueline Taylor, 2nd ed. (Cambridge: Cambridge University Press, 2009), 105–46, esp. 127–46; and Miren Boehm, "Filling the Gaps in Hume's Vacuums," *Hume Studies* 38 (2012): 79–99.

3 Rolf George has argued that Hume ascribed a minimal magnitude to the parts of space in "James Jurin Awakens Hume from his Dogmatic Slumber" (*Hume Studies* 32 [2006]: 141–66). Were this the case, Hume's claim that the indivisible parts of space would be "nothing in themselves . . . when not fill'd with something real and existent" (T 1.2.4.2; SBN 39) would fail. Points would be areas of some finite magnitude. As such, there would be something to them to make them real things. Or if not—if barely being an area of some finite magnitude would be insufficient to make a point "real"—there would need to be some further reason given for why this is the case. In the absence of such a further reason, Hume's appeal to the nothingness of unqualified points to prove that we can have no idea of a vacuum would be question-begging. Accepting that Hume considered the indivisible parts of space to have some magnitude would make it easier for me to pursue the project of this paper by giving me an excuse to dismiss this particular argument against forming the idea of a vacuum. But I cannot conceive why Hume would have attempted to build a case on appeal to the nothingness of the unqualified parts of space had he considered them to occupy some finite magnitude, so I shall assume that was never his intention.

4 The classic presentation of the summation problem in Hume's day was Pierre Bayle's, who wrote at the beginning of Note G of his *Dictionary* article on Zeno of Elea that, "It will take me only a few words to establish [that extension cannot be made up of mathematical points]; for persons of the slightest depth can comprehend with complete certainty, if they give the matter a little attention, that several nonentities of extension joined together will never make up an extension." Pierre Bayle, *Historical and Critical Dictionary: Selections*, trans. Richard H. Popkin (Indianapolis: Hackett, 1991), 359–60. For discussion, see Robert J. Fogelin, *Hume's Skepticism in the* Treatise of Human Nature (London: Routledge, 1985), 25–26 and 32–35.

5 I say more about the summation problem later but set it aside here, as it is not immediately pertinent to examining his reasons for denying ideas of a vacuum.

6 All of these terms are used indiscriminately and apparently synonymously over T 1.2.3.14–15 (SBN 38).

7 The Clarendon Press critical edition of David Hume's *Treatise of Human Nature*, ed. David Fate Norton and Mary Norton (Oxford: Clarendon Press, 2007), 2:704, and the Oxford Philosophical Texts student edition (Oxford: Oxford University Press, 2005), 432.

8 George Berkeley, *Principles*, introduction, x, in George Berkeley, *Philosophical Works, Including the Works on Vision*, ed. Michael R. Ayers (London: Dent, 1975; reprint ed. 1998),

78. The second lifetime edition (London: Jacob Tonson, 1734), 11, contains "parts or qualities" where the Dent edition prints "parts of qualities."

9 A reference to a further supposition that "in the extended object, or composition of colour'd points from which we first receiv'd the idea of extension, the points were of a purple colour" (T 1.2.3.4; SBN 34) comes up at the outset of the following paragraph.

10 To be precise, the possibility of separate existence is both sufficient and necessary for separability by the imagination, so it is the only criterion for separability by the imagination. Origination from different sense organs and disposition at different locations in time or space are individually sufficient conditions for the possibility of separate existence and so are more remote criteria for separability by the imagination.

11 See Lorne Falkenstein, "Space and Time," in *The Blackwell Guide to Hume's* Treatise, ed. Saul Traiger (Malden, MA: Blackwell, 2006), 59–76.

12 As with the doctrine of finite divisibility, Hume's account of abstraction is one we must follow him in accepting for the sake of proceeding to the question at hand.

13 See, for example, Costa, "Hume, Strict Identity, and Time's Vacuum," 3–4 and Don Garrett, *Cognition and Commitment in Hume's Philosophy* (New York: Oxford, 1997), 54. Boehm opens and closes her paper "Filling the Gaps in Hume's Vacuums" by representing the argument from the definition of space and time as manners of disposition as if it were the only argument Hume had to offer (Boehm, 79–80, 96). Baxter recognizes the existence of the argument from the non-entity of unqualified parts (Baxter 127–31) but only invokes the abstraction argument when explaining why Hume rejected the idea of vacuum (Baxter, 136), though the non-entity of unqualified points is briefly recalled to support a specific claim (Baxter, 142).

14 See Baxter, "Hume's Theory of Space and Time," 138 and Boehm, 82, 85, and 91. Costa writes that when the imagination tries to form the idea of the darkness between two stars it discovers that "it does not have an idea at all," referencing SBN 57, which contains T 1.2.5.11 (Costa, 5). Boehm claims to have been the first to have recognized that Hume did not take the "invisible and intangible distance" between the stars to be any sort of distance at all (Boehm, 89), but elsewhere (84) she recognizes that Costa appreciated the point (which he obviously did in Costa, 5–6) and only complains that he failed to justify it (Boehm, 84). However, though Costa's reference to the idea of darkness being no idea at all may be brief, it contains everything of substance that Boehm has to observe on this matter. The same might be said of any commentator who is invested in Hume's claim that darkness and the absence of light can convey no idea of distance, extension, or space to the blind and so can convey none to the sighted, either. Baxter is charitably read as sharing Boehm's views on what Hume meant by "invisible distance" (Baxter, 138).

15 Boehm objects that "one ought to be careful about imputing to ordinary people views about vacuums" (Boehm, 90). Hume did not agree. He believed that we all revert to the attitudes of the vulgar when we leave the study, and therefore we are all in a position to pronounce with authority concerning what at least one vulgar person believes (T 1.4.7.9–10; SBN 269 and EHU 12.23; SBN 160).

16 Baxter claims otherwise but without explaining what to make of Hume's explicit declaration to the contrary (Baxter, "Hume's Theory of Space and Time," 137). Boehm

also claims otherwise and goes to some lengths to argue that all Hume meant to affirm when he allowed that a vacuum might exist is that bodies might affect our senses in such a way that we are impelled, by certain psychological factors, to form the "fictitious" and "imaginary" idea of an empty space, though there is nothing in "what is present to the senses" (as opposed to "the perceivers' reaction to what is present to the senses") that involves any sort of unoccupied distance or empty space (Boehm, 90–92). Boehm's account will be considered in more detail later. For now, I will just observe that the hard question for Boehm is how to respond to Garrett's observation in *Cognition and Commitment* that Hume could not allow that bodies are so disposed as to allow other bodies to come between them without impulse or penetration while still allowing that vacua do not exist in nature (Garrett, 55). I show below that there is little prospect of explaining how bodies that are not, in fact, separated by some distance might allow, nonetheless, other bodies to come between them without moving or being occluded.

17 There might be a more charitable way to read the passage I have quoted. Hume might have only wanted to claim that just as Newton refrained from explaining gravitation by hypothetically *affirming* the existence of some subtle matter between those bodies that attract at a distance, so he would have refrained from explaining interposition by hypothetically *denying* the existence of some subtle matter between those sensible bodies that allow other sensible bodies to come between them. But the question of whether there is aether between the bodies or a true vacuum can only arise if the bodies are supposed to be disposed at non-contiguous locations in space. If they are disposed at contiguous locations, then there is no room for anything between them, and nothing to refrain from speculating about. Hume's claim that "[t]he real nature of this position of bodies is unknown" (T1.2.5.26n; SBN 639) asserts that there is something puzzling about how bodies that have nothing *sensible* between them can nonetheless be so positioned that other bodies can come in between them even though the original bodies do not move aside or get occluded or penetrated. Supposing such bodies to be separated by an *insensible* aether does nothing to resolve the purported problem of explaining how that *sensory* experience is possible—no more than supposing them to be separated by total darkness.

18 See, for instance, *The Philosophical Writings of Descartes*, trans. John Cottingham, Robert Stoothoff and Dugald Murdoch, vol. 1 (Cambridge: Cambridge University Press, 1985), 230–31.

19 An exception to the common answer is Garrett. According to Garrett, Hume's view was that "[w]e do have . . . spatially complex perceptions, some of whose component parts are not contiguous but have no other perception between them" (Garrett, 54). This is tantamount to admitting that we do have complex perceptions of empty spaces, albeit ones bracketed by quality points. Garrett continues, "Hume is concerned only to deny that the unfilled 'fictitious distance' between such noncontiguous perceptions is *itself another perception* . . . there are no perceptions of the vacuum itself, as something that occupies the unfilled locations" (Garrett, 54). If Garrett means another perception distinct and separable from the perception of the surroundings, I agree. There are no distinct perceptions of "the vacuum itself" for reasons given at the close of part 1 above. It does not follow that there are no perceptions of vacua interspersed between real things. To claim that there are no perceptions of "the vacuum itself" while allowing that there are "complex perceptions" of real things that are not contiguous is to insist

on a moot point while failing to address the real challenge: explaining what would make a complex perception of real things that are not contiguous anything other than a complex perception of real things that are separated by an empty space.

20 Broad's endorsement of Hume's account of the idea of vacuum (he went so far as to declare it a "platitude") springs from his failure to appreciate this point. When dark points are considered to be colored black, it is indeed a platitude that we can form no idea of empty space. But that was not Hume's view. See Broad, "Hume's Doctrine of Space," 171.

21 This should make it clear that the solution being presented here, which is Hume's actually stated solution, is rather different from the solution conjecturally attributed to him in part 2 above on the basis of what he wrote in T 1.2.5.26n (SBN 638–39). The conjectural solution supposes that there are two kinds of distance, only one of which is space, raising the question of how an unoccupied "invisible and intangible distance" can be non-trivially distinguished from an empty space. The actual solution also recognizes two kinds of distance but takes the one to be only mediately perceived and "falsly imagin'd" to be really present. The actual solution does not require any distinction between an invisible and intangible distance and empty space.

22 Baxter makes a similar observation (Baxter, 141).

23 Margaret Atherton, *Berkeley's Revolution in Vision* (Ithaca, NY: Cornell University Press, 1990), 90.

24 This is admittedly a controversial claim. I have attempted to defend it in a series of case studies. See, most notably, Lorne Falkenstein, "Intuition and Construction in Berkeley's Account of Visual Space," *Journal of the History of Philosophy* 32 (1994): 63–84; Falkenstein, *Kant's Intuitionism* (Toronto: University of Toronto Press, 1995); Falkenstein, "Reid's Critique of Berkeley's Position on the Inverted Image," *Reid Studies* 4 (2000–2001): 35–51; Falkenstein, "Reid and Smith on Vision," *The Journal of Scottish Philosophy* 2 (2004): 103–18; Falkenstein, "Condillac's Paradox," *Journal of the History of Philosophy* 43 (2005): 403–35; and Falkenstein, "Theories of Perception I and II," in *The Routledge Companion to Eighteenth Century Philosophy*, ed. Aaron Garrett (London: Routledge, 2014), 338–59 and 360–80. My claim that Berkeley's constructivism is incomplete has since been independently corroborated by Rick Grush, in "Berkeley and the Spatiality of Vision," *Journal of the History of Philosophy* 45 (2007): 413–42.

25 Falkenstein, "Hume on Manners of Disposition and the Ideas of Space and Time," *Archiv für Geschichte der Philosophie* 79 (1997): 179–201.

26 Hume's commitment to two-dimensionalism about immediate visual experience is not clear from his published works but was expressed in his 4 July 1762 letter to Hugh Blair commenting on Reid's draft *Inquiry*: "Touch alone gives us an Idea of three dimensions." See the reprint of Hume's letter in Thomas Reid, *An Inquiry into the Human Mind: A Critical Edition*, ed. Derek R. Brookes (ed) (University Park: The Pennsylvania State University Press, 1997), 256.

27 Admittedly this would not necessarily be a vicious regress where infinite space is concerned, but we are worried about the grounds of our representation of bounded spaces like visual fields and body maps.

28 The ordering relation governing the sequence <1/2, 3/4, 7/8, ...> does not permit any further fractions to be disposed between the given fractions, but the sequence still does not meet the limit 1 and in this sense fails to swell up in proportion to the number of added members. Like Baxter, I take Hume's claim that the relation governing the order of spatial points is not like this to be a matter of fact, founded on experience of the sort invoked in this passage. (See Baxter 129–30.)

29 Unoccupied spaces must be spaces of some particular size and shape. The size and the shape are defined by edges. There can be no edge where there is no limit of the extent of some sensible quality. So Hume could safely insist that empty spaces cannot be conceived apart from sensible surroundings.