

Atoms and orientation

Vasubandhu's solution to the problem of contact

AMBER CARPENTER, WITH SHERICE NGASERIN

INTRODUCING VASUBANDHU, BUDDHIST ATOMIST

Vasubandhu (fourth century CE) was a Buddhist philosopher working, originally at least, in the Abhidharma tradition.¹ The Abhidharma philosophers made it their ambition to make more precise and systematic the various epistemological and metaphysical claims the Buddha made in the course of his informal discourses. Ābhidharmikas held a wide range of different views, debating among each other as well as against non-Buddhists and, from about the first century CE, against Mahāyāna Buddhists. They were broadly united by a metaphysics of *dharma*s, classified in various ways according to different purposes. Naturally, what exactly a *dharma* is, and which *dharma*s there are, was a matter of dispute.

Vasubandhu, a celebrated master of debate, contributed the most precise and comprehensive statement of one of the most well worked out Abhidharma Buddhist positions of his time (that of the Vaibhāṣikas), as well as some of the most trenchant critiques of that position. He did so in what is effectively the same work, namely the *Abhidharmakośabhāṣya* – the *Treasury of Abhidharma* (*Abhidharmakośa*) with commentary (*bhāṣya*).²

Vasubandhu's metaphysics has been likened to trope theory,³ and it is not hard to see why. His position in the *Abhidharmakośabhāṣya*, like most Abhidharma positions (and all those taking their cue from the *Vibhāṣā*⁴), eschews any form of universals; and moreover, it does so by eliminating from the root the substance-property metaphysics which gives rise to the need for universals in the first place.⁵ What *really* exists are occurrences of particular properties – and that is all. They are 'occurrences' because, for reasons Vasubandhu gives at *AKBh.* VI.2b-3b, these property-particulars do not endure or perdure or persist in any way.⁶ Their very existence is the cause of their ceasing to exist, and so to arise is to pass away, making all existences of ultimately real things strictly momentary.

Take this as our first indication that this is not trope theory as we know it. The argument for momentariness relies on the presumption that a property-particular cannot unfold its nature over time.⁷ As far as Vasubandhu is concerned, being a trope,

or a property-particular or *dharma*, in this sense means neither bearing properties nor inhering as a property in a substance. From this follows the impossibility of a thing changing, with the appearance of change secured by the difference in which *dharmas* exist at different moments.⁸ Such *dharmas* may be either mental or physical in kind – nothing about the view, or the arguments for it, rely on the corporeality of *dharmas*, and Vasubandhu (again like all his Abhidharma peers) took it that there were both mental and non-mental *dharmas*. Particular moments of mental properties will be just as momentary as the physical *dharmas* and for the same reason. Vasubandhu is, then, a strict atomist, and it is the atomist principle that leads to his understanding of *dharmas* as property-particular occurrences, rather than property-bearing substances.⁹

Vasubandhu's commitment to the atomist principle is articulated at *AKBh.* VI.4, which is regularly taken to be the definitive articulation of his understanding of the distinction between what we might call fundamental (and he would call ultimate) reality and everything else – what he calls 'conventional' reality, or the way everything that is not a *dharma* (but is composed of *dharmas*) exists.

There is no idea of a pot when it is broken, and none of water when it is analysed by the mind. That which is like the pot and water is conventionally real. The rest is ultimately real.¹⁰

It is criterial of existing ultimately, or fundamentally, that an existent 'survives analysis' – that is, no division can make it cease to exist. Vasubandhu specifies two sorts of divisibility: physical and conceptual. Physical divisibility is straightforward enough, and Vasubandhu does not specify whether it means divisible by part or within a homogeneous mass,¹¹ nor whether it means divisible in practice (as a thing a centimetre long) or divisible in principle (as a thing a nanometre long). He does not need to, because he has a second sort of divisibility ready to hand: divisible 'in the mind', or conceptual divisibility. According to Vasubandhu, even what is conceptually divisible is thereby shown to be merely conventionally, and not ultimately, real. This conceptual divisibility is not just the sort that applies to lengths – any mathematician can halve the nanometre, whether or not the two halves can be physically prised apart. Vasubandhu's conceptual divisibility applies, for instance, to the distinction one can make between the coolness of the water and its translucence. This is what 'analysing' water with the mind involves. Such analysis applies equally to mental things (if any there be) as well as to concepts. My burning resentment over an unwarranted slight may indeed cause me to act; but it consists wholly in an interacting set of judgements, intentions, recollections, perceptions, desires and conceptualizations – and its reality as a single thing is merely conventional, not ultimate.

This is an absolute atomism, far beyond what Democritus envisaged, with his atoms of multiple shapes, and his presumption of souls as unified *loci* of multiple experiences.¹² Such an atomism is not primarily animated by concerns about extension – although the principle of divisibility will apply there, too. Wherever a *conceptual* distinction may be drawn, this suffices as demonstration that there are as many distinct entities as are distinguished, and the analysand, if it is not identical

to some one of the final *analysata* is not an ultimately existing thing – for what is analysable by mind is thereby shown to have been put together by the mind.¹³

If this is trope theory, it is a very austere trope theory indeed.¹⁴ Any collection of *dharma*s is not ultimately real – whether that collection is notionally or physically or temporally aggregated, whether of the same kind or not (*AKBh.* I.20ab), whether mutually conditioning (as the person-constituting aggregations of *dharma*s, *AKBh.* IX¹⁵) or not. Vasubandhu's immediate Ābhidharmika associates (often called Vaibhāṣikas for their core text, the *Vibhāṣā*, or sometimes, more specifically, Sarvāstivādins after their core commitment) had already recognized the impossibility of anything like real locomotion, once the momentariness of *dharma*s is agreed. But with his principle of 'surviving analysis', Vasubandhu goes them one better and explicitly argues against shape's being ultimately real (*AKBh.* IV.3c). For any shape, whether physically instantiated or not, is divisible notionally – it has distinguishable parts and is therefore only conventionally real. 'Shape is not in an atom. There is no atom of length' (*AKBh.* IV.3c).¹⁶ Vasubandhu then tacitly appeals to the principle cited earlier (but stated only later in the *Abhidharmakośabhāṣya*) concerning the conventionality of what dissolves under analysis: as it diminishes, length is no longer cognized; this demonstrates, Vasubandhu argues, that length is not something ultimately real.¹⁷

But of course anything of any dimensions at all must necessarily have some shape – it must have, at least, length, which Vasubandhu treats as a kind of shape and equally unreal for the same reasons. Unlike Epicurus, then, Vasubandhu cannot have an atomism of a sort that asserts *minima* as constituting the fundament of physical reality, bulking it up through their accumulation.¹⁸ Vasubandhu's physical *dharma*s – the *paramāṇus* – must be dimensionless point-particle property-events.¹⁹

Thus, regarding the physical *dharma*s, Vasubandhu's atomism suffers acutely the twin problems of agglomeration and contact. The Problem of Agglomeration arises from the fact that dimensionlessness plus any number of additional dimensionlessness bits can only ever be dimensionless. So dimensionless atoms cannot, it seems, constitute the basis of even the appearance or illusion of spatially extended objects. The Problem of Contact arises from the attempt to agglomerate truly simple, dimensionless atoms into lengths and shapes by placing them adjacent to one another: if they are in contact, then either they have parts (the parts touching while the rest does not) or, remaining partless, they wholly touch and thus coincide completely and end up occupying the same space. Vasubandhu addresses these related objections in Book I of the *Commentary on the Treasury of Abhidharma*.

THE PROBLEMS OF CONTACT AND AGGREGATION

The Problem of Contact is raised in a discussion about the way that the non-distal senses – taste, touch, smell – operate. Unlike the senses of sight and hearing, which operate at a distance, the non-distal senses are said to attain their objects. That is, unlike sight and hearing, senses such as touch cannot operate at a distance. They must, as we say, make contact with their objects in order for perception along that modality to arise.

This poses an immediate problem for atomism, at least for the sensible atoms constituting the organs and objects of perception, and designated by the term *paramānu*.²⁰ If the organ must be in contact with its object, then presumably contact between the constituent atoms of organ and object must be in principle possible. But such contact seems to be inconsistent with atomism, as had already been recognized by Vasubandhu's predecessors, referred to here as 'the Kaśmīris', who conclude that atoms 'do not touch' because '[i]f they were to touch completely, things²¹ would coalesce. Then suppose instead that they were to touch at one spot. There would be the unwanted result that they have parts – and atoms do not have parts' (*AKBh.* I.43d(4)).

The dilemma is this: if atoms were to touch, they must either touch in their entirety or touch at a point (or in part). But atoms cannot touch in their entirety. If they did, they would be entirely in the same place (coalesced). And in this way, there could never be aggregation, nor contact of a sense organ with its object to produce a perception. The sense organ would occupy the space of the object without ever making contact.²² And in general any agglomeration of atoms-in-contact would end up with atoms simply occupying the same spot. But neither can we avoid coalescence by supposing atoms touch at a point instead; for if one atom touched another at one point, but not at another, then this atom would have two points, genuinely distinct from one another. The points must be genuinely distinct, for if the point-of-contact of atoms *a* and *b* were not different from the rest of atom *a* and the rest of atom *b*, it would be identical to the whole of both atoms and we have the problem of coalescence. But comprising multiple distinct parts already violates the simplicity required of atoms.

The option of avoiding the dilemma by appeal to indivisibles comprising multiple distinct points (extended *minima*) is not entertained by Vasubandhu and is indeed precluded by his insistence at *AKBh.* IV.3 that shape, including length, is not ultimately real. And even supposing we could make sense of dimensionless points touching partially, this would violate the principle of atomism as Vasubandhu has laid it out. For there would be even so a conceptual distinction between the in-contact part and the not-in-contact part of an atom, and once these were distinguished, the atom itself would no longer be in either place (or, conversely, the atom requires taking the two parts together as a single thing). Such analysability – or such taking one thing to be two things – is, on the Abhidharma view, an indication that genuinely distinct things have been put together by the mind. Even dimensionless atoms partially in contact and partially not (if such there could be) would have parts and not therefore be atoms.

So atoms can touch neither partially nor wholly. If they cannot touch, they cannot aggregate to form familiar macro-objects, so atomism cannot explain the apparent objects of everyday perception that it was supposed to ground. Further, if atoms cannot touch, there is no discernible difference between the distal and the non-distal senses: both do not attain their objects (alternatively, the distinction remains, but atomism cannot account for non-distal perception). Yet it is agreed that if the tongue does not attain its object, there is no taste; and in general, where non-distal sense-organs do not attain their objects, no sensation of that sort arises.

The canonical Vaibhāṣika response to this last difficulty seems to involve rejecting the presumption that in order for macro-objects – the organ and its object – to touch, their constitutive atoms must touch. There is no error, Vasubandhu has them say, in the claim that ‘agglomerations touch because they have parts’ (*AKBh.* I.43d(8)). Macro-objects are partite, they consist of multiple atoms; so there is no problem about *them* making contact in part. Vasubandhu has little patience for this evasion, saying simply, ‘it is not the case that agglomerations are anything other than atoms’ (*AKBh.* I.43d(12)). If atoms cannot touch, neither can agglomerations of atoms, on pain of the agglomeration being something over and above its atomic constituents; conversely, if agglomerations make contact, they can do so only by their constituent atoms touching.²³ Moreover, the supposition that agglomerations touch while atoms do not would not address the prior difficulty of agglomeration, closely associated with the Problem of Contact; without agglomeration, there are no macro-objects for which partial contact could be unproblematic.

Vasubandhu does, however, have more time for the basic bullet-biting stance of the Vaibhāṣika position: atoms do not touch. If senses are to attain their objects, it will have to be by juxtaposition without interval – yet without touching. ‘What is this term “attain”? Occurring without interval.’²⁴ This is the proposal as Vasubandhu inherits the discussion, and the challenge is to adjudicate between different understandings of ‘without interval’ and discover one that permits non-distal perception and aggregation of physical atoms. This is no small challenge, for ‘contactless immediate juxtaposition’ is not exactly perspicuous. Indeed, it might seem more a description of the problem than an actual solution. Vasubandhu canvasses two different options of how this trick might be turned, depending on what ‘without interval’ means.

The suggestion Vasubandhu inherits and rejects looks promising enough. According to the Vaibhāṣikas, ‘There not being anything in the middle is indeed a state of non-interval for these [organs]’ (*AKBh.* I.43d(7)) – that is, where there is no third *paramāṇu* between two *paramāṇus*, these two are without interval with respect to each other. This interpretation of ‘without interval’ is the more promising as space is not itself considered a thing (*AKBh.* I.5c; *AKBh.* II.55d) – thus, empty space between two atoms is the same as there being nothing intervening between them.²⁵ On this view, non-distal sense-organs reach their objects when no thing intervenes. They do not in fact *touch* because there is a gap between them – an unoccupied interval ensuring against the fracturing of atoms contact would imply.²⁶ The sense *organ* may make contact with its object without coalescence, for both macro-objects are admittedly partite, so they may touch in part without being wholly collocated. Their respective constituent atoms, however, do not touch, but rather remain all at an empty interval from each other, so that they may aggregate without compromising their atomicity.

Vasubandhu rejects this straightforward solution which takes ‘without interval’ as ‘without any thing intervening’, an empty gap sparing atoms any actual contact, while at the same time allowing that aggregations (such as sense organ and sense object) may touch. He does this for two reasons. First, he rejects asymmetry. Aggregations of atoms cannot touch without their constituent atoms touching – unless, of course,

one takes the aggregate to be something other than its aggregated atoms. Naturally that is a possible position; but it is not an Abhidharma position, and anyone willing to endorse that will not have the problem of contact in the first place, since they evidently do not suppose that being complex, or ‘analysable’, is tantamount to being only conventionally real, and not ultimately, mind-independently so. If partite entities could be ultimately real, then there would be no need to posit an asymmetry between touching aggregates and their contactless constituents, for the constituents themselves would not be vulnerable to the Problem of Contact in the first place. But the gappy interpretation of ‘without interval’ was meant to save *anti-holist atomism* – a view that rejects the independent reality of any partite entities; and it can only do that by positing an inconsistent asymmetry between aggregates and their constituents – or else by conceding that neither atoms *nor* aggregations of them make contact with one another.

Conceding that neither aggregations nor atoms make contact may not seem particularly significant. After all, any version of the view under discussion is re-defining what ‘contact’ means in such a way that it does not involve actual *contact*. At least, that is in effect what has happened at the atomic level – an organ ‘attains’ its object when there is no intervening thing between organ-atoms and object-atoms, all of which stand with decent intervals of empty space between them; accepting that it follows from this that the macro-objects do not really touch one another does not seem a lot more to swallow.²⁷

But Vasubandhu does not rest his critique of this interpretation of ‘without interval’ on this. His second ground for rejecting this Vaibhāṣika solution goes for the gap. Although the position can be stated without reference to a void or gap between atoms, the ‘no intervening thing’ view of ‘without interval’ is distinguished from its alternative by holding that instead of an intervening *thing* there is an unoccupied interval surrounding each atom. Without such a void, we are returned to the puzzle of how to understand immediate adjacency (atoms being without interval) in such a way that it is not in fact just plain old contact – and thus we are returned to the problem of contact itself: either adjacent atoms touch at a point and so have parts, or they make contact in their entireties and thus occupy the very same space (coalesce). But such a void, Vasubandhu claims, is impossible. And therefore the whole interpretation collapses.

Vasubandhu’s argument against the void is very compressed and relies on claims and commitments argued for in other passages. The first of these is the claim that space is not absolute. Space, he argues at *AKBh.* II.55cd, is not itself a thing (*dravya*, *vastu*); if it were, it would be an extended thing and thus not fundamentally real anyway. Rather space is simply the absence of obstruction to a *paramāṇu* arising (*AKBh.* I.5d). The only obstructions to atoms arising are other atoms (*AKBh.* I.13); so space is, as such, just an absence of such atoms preventing other atoms from arising. It is no positive entity in its own right, and it has no causal powers (*AKBh.* II.55cd). But this means, as Vasubandhu observes here in our current passage concerning contact, that space certainly cannot *prevent* an atom from arising – ‘were atoms to have space in between them, by what would their going into the empty intervals be restrained?’, Vasubandhu asks rhetorically (*AKBh.* I.43d(11)), since resistance is

needed to block the arising of atoms (*AKBh.* I.43d(12)), and space by definition does not resist or obstruct the arising of atoms. Indeed, the only thing that offers resistance is another atom; but if an atom obstructed the arising of another atom, then the space was not empty after all. Therefore, there can be no void, and so the interpretation of ‘without interval’ as ‘without intervening thing’ collapses.

This dispatches the first interpretation of ‘without interval’. There remains a second. This is the much more obvious construal of ‘without interval’ as *without interval*. That is, there is nothing at all intervening between atoms – not another atom, not an interval of atom-free space. This is what Vasubandhu takes to be the view of his Ābhidharmika predecessor, Vasumitra, who seems to have put it forward in response to a different worry, and not in relation to the problem of contact.²⁸ According to Vasumitra, atoms ‘do not touch; but there is the cognition of touch when they are without interval’ (*AKBh.* I.43d(10)).²⁹

This, Vasubandhu affirms, is the correct position.³⁰ The only difficulty is in making out what the position is – or rather, more importantly, how it could possibly be thought to solve the problem of contact, rather than introduce it. As the Ābhidharmika Saṃghabhadra puts it in his *Nyāyānusāra*, ‘If one says that atoms absolutely are without any intermediate space between them, and yet are not mixed one with another, they must have parts: a false opinion. Otherwise, if *nirantara* signifies “without interval” (*anantara*), how is it that the atoms do not touch one another?’³¹

RESISTANCE IS USELESS! ... OR IS IT?

Vasubandhu is shockingly reticent here. He has endorsed the claim that atoms do not *really* touch, that the correct position to take is that *we say* atoms touch, or *cognize them as* touching, under certain circumstances – namely when they are immediately adjacent. This is a conception or cognition, *saṃjñā*, that we supply when experiencing what is, taken in itself, merely immediate adjacency, or atoms being without interval. This adjacency must be properly immediate – not even empty space intervening; for Vasubandhu insists such empty spaces are not possible. Space, being no positive thing, is mere the absence of obstruction to *dharma*s arising. And where there is no obstruction to arising, there is the arising of *dharma*s. So Vasubandhu’s interpretation of ‘without interval’ must be one that is indistinguishable from actual touching. How then has he not just returned us to the original Problem of Contact?

Directly addressing the problem in his own voice, Vasubandhu remarks briefly and without further comment:

regarding atoms: if division according to directions is being supposed, then there is the unwanted result that they have parts – whether they touch or not.³² If not supposed, then even when they do touch, there is no unwanted result. (*AKBh.* I.43(13))

This unelaborated conclusion to the discussion is almost shocking, for it seems to be dismissing the Problem of Contact out of hand, rather than offering a solution

to it. 'If you think contact is a problem for atomism', Vasubandhu seems to say, 'then it is; but if you don't, then it isn't'. This looks like an appeal to table-banging and strength of mind – 'simply do not concede partition in the first place, then no amount of contact and touching could force you to do so' – and these are poor ways of meeting a metaphysical argument. One has sympathy for Saṃghabhadra's complaint that Vasubandhu has simply missed the point of the Problem of Contact.

Now there is an important insight in the first part of Vasubandhu's observation. *If* one supposes – for whatever reason – that atoms have a left side, say, and a right side, and these are not identical, then one is already taking them to be partite entities. Once you have done this, no amount of theorizing about intervals and voids will restore their original unity. Let there be ever so much unfilled space between atoms; this will not prevent the left side being different from the right side, if they are in fact different. Moreover, if the left side and the right side of an atom have to be genuinely distinct (even if collocated at the same point) in order to avoid coalescence, then these directional parts must be genuinely distinct in order to avoid coalescence even if there is no contact. Even if a void were possible, addressing the Problem of Contact by positing a gap only causes the problem to re-emerge as the more refined Problem of Directionality, a version of the problem which makes it clear that the threat of partition in no way depends upon the notion of extension. Orientation itself suffices to split the atom, on Vasubandhu's principle of analysability, if upwards of an extensionless atom must be genuinely distinct from downwards.

The Vaibhāṣikas thought that if atom *a* touches another atom *b* at a point, *a* must have a *b*-touching part and a non-*b*-touching part, and similarly for atom *b*, thus impugning the simplicity of both atoms. Any atom-in-contact would have as many parts as there were atoms with which it was in contact. Their solution was to insert a space between *a* and *b*. If there is no contact between distinct atoms, there is no need for any to have a point-of-contact distinct from its other part, then there will be no problematic partitioning of atoms.

But Vasubandhu observes that they have misdiagnosed the problem: if the partitioning of atoms is a concern, it is not a problem caused by contact, but by directionality alone.³³ For atoms which are not in contact must still have directional orientation, at least so long as there is more than one atom (and only a theory of multitudinous atoms could account for the macro-objects of everyday perception). Even with an empty interval between atoms, any given atom must have a 'rightwards' that is *genuinely distinct* from its 'leftwards', and equally its 'upwards' and 'downwards' must each be genuinely distinct from the others. If they are not properly distinct, then there is no difference between the interval on the left and the interval on the right, and coalescence threatens again. If, however, they *are* genuinely distinct, then partition threatens just as much as if the atoms touched.

Thus, if there *is* a problem at all, it is much bigger than the Problem of Contact (and its proposed solution) supposed, for there is nothing special about *contact* that forces partition. Simple juxtaposition with respect to one another suffices to make atoms partite. Once the magnitude of the difficulty is clear, there is motivation

enough to reject the antecedent and deny altogether that there is a genuine problem. The question remains, on what grounds Vasubandhu can legitimately do this.

The reformulated problem focuses attention back on aggregation. If atoms exist contemporaneously in some spatial relations to one another, then their tops must be *genuinely* distinct from their bottoms – not merely conceived by us as such – in order to avoid the atom above occupying the same place as the atom below, namely the same place as the atom in the middle. A commitment to absolute space might resolve this, for then position could be fixed absolutely, without reference to other atoms. The top of a point may be identical to its bottom, but the point-particle atoms above and below it occupy their respective positions independently of this, and there is, as Vasubandhu observes, no need to suppose atoms must be partite in order to avoid the collapse of the universe, the coalescence of all into a single point (or perhaps all into every point?). But Vasubandhu and his atomist brethren reject absolute space, Vasubandhu arguing particularly emphatically that space, being an unconditioned *dharma*, is acausal and not a thing in any sense, but rather is simply the absence of obstruction.³⁴ So we must search elsewhere for some basis for Vasubandhu's confidence that the Problem of Directionality is a non-problem.

The place to look is in Vasubandhu's immediately preceding argument against the void. His explanation there for why there cannot be an empty interval of space includes the reminder that 'resistance is needed'³⁵ to obstruct the arising of *paramāṇus*, or *rūpa dharmas*. This 'resistance' cannot be provided by space, but can only be provided by other *rūpa dharmas*, because this is just what it is for something to be *rūpa* (a sensible property).

Earlier in the text, at *Abhidharmakośabhāṣya* I.13, Vasubandhu canvassed two different understandings of *rūpa*, the latter and more promising of which is 'resistance' (*AKBh.* I.13).³⁶ This understanding of *rūpa* as resistance is endorsed several verses later, in a discussion of the basic elements of reality (*AKBh.* I.28-29). 'The ten [elements] which have the characteristic of *rūpa* have resistance',³⁷ which is to say that they 'obstruct the arising of another in its place',³⁸ and so are in this sense capable of colliding (*AKBh.* I.29bc). Whatever is *rūpa* is such that it would, by virtue of its existing, prevent anything else *rūpa* from being where it is.³⁹

Vasubandhu then appeals implicitly to this point about *rūpa* in his discussion of the Problem of Contact. In the course of defending the claim that there is no actual contact among atoms, Vasubandhu must meet the objection that without contact sound could not arise. His table-turning reply, which he is simply relaying from the *Vibhāṣa* itself, asserts that if there *were* real contact, there would be no sound, for 'if they were to touch, a hand which strikes at a hand, a rock which strikes at a rock, would become attached' (*AKBh.* I.43d(5)). Precisely because there is *no* contact, he says, sound is possible. This is only a reply to the objection if we import the point from I.28-29, that material *dharmas* resist other material *dharmas*. 'Just as a hand strikes at a hand or a rock at a rock, these also [strike back].'⁴⁰ Note how references to two hands clapping tie the two passages together. When one hand strikes at another, they do not become attached or coalesce. For the hands (or the two rocks), being *rūpa*, are said to resist or 'strike back' – a hand repels another hand simply by preventing it from occupying its own place and thus, at *AKBh.* I.43d, giving rise

to sound. This, Vasubandhu claims, is what it means to say material *dharma*s resist each other.⁴¹

So the claim that atoms prevent each other from arising where they are is already in the background when Vasubandhu goes on to claim, in his argument against the void, that an atom is the *only* thing that precludes another atom from arising. Space is acausal (*AKBh.* II.55d) and, as a mere absence, can offer no resistance to the arising of material *dharma*s. By contrast, preventing another atom from being where it is is what any atom does just by its very existence.

But if that is what an atom does just by occurring, then the Problem of Contact dissolves. *Paramāṇus* are dimensionless point-particle occurrences of properties. They are the converse of space: for an atom to be is to preclude or resist some other atom being just there where it is. If that is just what it is for an atom to be, then there need be no appeal to their ‘sides’ or directions, nor even to absolute space, in order for aggregation to be possible. Atoms aggregate, rather than coalesce, because any atom being here now precludes any other atom being here now. Coalescence is avoided not by a specific kind of contact or lack thereof, but by *resistance*. For an atom to be is for it to prevent the arising of any other atom at this point of occurrence. Nothing in this explanation requires that there be a point of contact distinct from the whole atom, or space between atoms to prevent collapse into one point. It is simply atoms happening that prevents that outcome. If we hold fast to this, then indeed we do not need to suppose that either points-of-contact or directional ‘parts’ are inevitably implied as ultimately real, whether by gappy locatedness or by immediate adjacency.

Do these atoms therefore actually touch? Being able to answer this question negatively is essential to Vasubandhu’s dissolution of the problem – for actual touching, as that is commonly understood, does require a point of contact and would therefore imply partition. Yet Vasubandhu’s negative answer to this does not take the form of asserting the opposite, that the atoms are *not* in contact, as if floating in space at a safe distance from each other could solve the problem. No such distance could be safe, for if ‘sides’ are really real, then so too by the same reasoning must directions be real parts of atoms.

This is the point at which Vasubandhu’s interpretation of Vasumitra is relevant. Vasumitra was the one, Vasubandhu approvingly tells us, who observed that ‘[atoms] do not touch; but there is a cognition of touch when they are without interval’ (*AKBh* I.43(10)). Atoms are without interval inasmuch as they resist each other and nothing else can offer an obstacle to an atom’s existing. But *touching*, or ‘being in contact’, is a relation between atoms, not something that belongs to any particular atom. As a relation, it is partite, does not survive analysis and is therefore at best conventionally and not ultimately real. So, similarly, being above or below are relations that we draw in the course of ordering our perceptions, not really existing perceptible things. To note that relations are for this reason conventional is to acknowledge that relations arise from *our relating things* – that is, from our cognizing essentially independent individuals *as* standing in some relation to one another.

This is the significance of Vasumitra’s observation that the *cognition* ‘in contact’ or ‘these atoms are touching’ arises under certain circumstances – namely when

atoms are (as indeed they always are) without interval. When we perceive macro-objects as without interval, the cognition that they are in contact arises. So similarly, when we consider mentally that each dimensionless point has an atom located there, a cognition that the adjacent atoms are touching arises.⁴² Because the relating of two (or more) atoms as ‘in contact’ or ‘touching’ is something *we are doing* in order to construct an intelligible reality to navigate, there is no danger that this should in any way affect the atoms themselves, which remain dimensionless points of resistance, regardless of what is going on around them or how we conceive of that. When relating these atoms to each other, we could think of the resisting atom as resisting upwards, resisting downwards and so on. But this is not a perception of what is happening independently of our conceiving it. An atom is not engaging some special force of ‘resistance’ which it then deploys outwards in various directions. The atom simply is – for it to be is for it to resist or obstruct other atoms being where it is. As with touching, thinking of an atom as having multiple directional parts which each resist in a different direction, then, is a way we conceive it, not a way it has of being. The atoms no more have directional parts than they have points of contact. Even when the Problem of Contact is revealed to be a Problem of Directionality, Vasubandhu argues that it is a non-issue: these directional parts are not real parts, but *ex post facto* ways we have of ordering phenomena. This is not so much table-banging, then, as an invitation to be very precise about distinguishing cognitions, even inevitable cognitions of the world from how the world must in fact be.

Thus, by the end of the discussion of atoms in the *Abhidharmakośabhāṣya*, Vasubandhu can legitimately dismiss the Problem of Contact as a non-problem. Atoms – dimensionless, directionless simple occurrences of properties – exist in immediate juxtaposition to each other, and exist unproblematically in this way. Aggregation is thus equally unproblematic, as are collision and cohesion between macro-objects. Concerning the original question of non-distal perception which gave rise to the discussion, Vasubandhu’s determination that ‘touch’ and ‘contact’ are conventional or conceptual realities enables him to distinguish distal from non-distal perception according to whether or not the macro-objects of sense organ and object are cognized as immediately juxtaposed – when they are, we say the organ is in contact with its object; when not, not.

THE UNEXPECTED ENCORE

This elegant atomist account of contact and aggregation did not please all of Vasubandhu’s Abhidharma peers; but they seem not to have got the point that directionality partitions atoms every bit as much as contact, and so they persist in supposing the atomist cause would be helped by the introduction of empty spaces between atoms. More interesting is that Vasubandhu himself became dissatisfied with this atomist defence against the Problem of Contact.

In his *Twenty Verses*, Vasubandhu gives the anti-atomist argument from contact a second outing – but this time he comes down on the other side and takes it to show that atomism is incoherent.⁴³ Between the time of writing the two texts, Vasubandhu is said to have converted from the realist Abhidharma to the idealist Yogācāra – these

labels are approximate and disputed, but adequate for our purposes.⁴⁴ Vasubandhu had myriad reasons, nothing to do with partition and contact, for rejecting atomism simply as a form of realism. But to reject atomism as one species of realism, there is no need to revisit the particular problems special to atomism – one might do better to elaborate concerns over representationalism, say. Nevertheless, in verses 11-15 of the *Twenty Verses*, and the commentary on these, Vasubandhu reintroduces this argument from contact to argue specifically for the incoherence of *atomism*. What is it that has changed his mind about this argument in particular?

Vasubandhu offers no critique of his previous solution, or dissolution, of the Problem of Contact/Directionality. The aggregation of atoms as such still may not tell decisively against atomism. But Vasubandhu has discovered a related phenomenon that does. While the immediate juxtaposition of atoms necessary for aggregation may be made possible by the resistance each atom offers to being collocated with another, such resistance cannot explain the *opacity* of such aggregations (*Twenty Verses* 14b), and so it cannot explain their visibility. Opacity requires that light falling on one side of a thing not be falling on the opposite side. When we think of macro-objects, such as trees, this is clear and apparently unproblematic. But Vasubandhu has already observed in the *Abhidharmakośabhāṣya* that no proper atomist can admit really existing qualities of the whole that are not qualities of its constituents. How is it possible for an aggregation of atoms to be opaque, to cast a shadow and block light, if none of its constituent atoms does so? But if an *atom* blocks light, then it would have to be lit on one side and shaded on another – and thus it would have sides. These sides, moreover, would have to be really distinct parts and not *ex post facto* described thusly by us for our convenience. There must in fact be light on part but not all of the atom, and that lit part must be distinct from the shaded part.⁴⁵ Even if an atom is a point-particle and these two sides are in the same place, the lit side and shaded side are analysable without the original unit remaining – and therefore the atom is no atom in the *Ābhidharma* sense required in order to be ultimately real.

The resistance that any atom has to anything else being where it is can account for aggregations, but not for the visibility of these aggregations, for the resistance implied by the occurrence of an atomic property-particular does nothing to account for the asymmetry of opacity. Such asymmetry is fatal to the simplicity of atoms.

If Vasubandhu had worried about opacity when writing the *Abhidharmakośabhāṣya*, there is no evidence of it in the text; and the worry does not seem to have been raised in *Abhidharma* circles elsewhere. Its role in the *Twenty Verses* is to follow up arguments for the non-necessity of mind-independent reality with arguments for the *incoherence* of mind-independent reality as the Buddhist realists thought of it.⁴⁶ However, while the Problem of Opacity was not likely Vasubandhu's reason for discarding realism, it is very hard to see what Vasubandhu of the *Abhidharmakośabhāṣya* could have offered in defence of atomism, had he been presented with the argument from opacity. His ingenious dissolution of the Problem of Contact, and of the subtler Problem of Directionality which persists when contact is avoided by positing a gap, draws on the resistance any *rūpa dharma* offers, just by its existence, to there being another *rūpa dharma* just here. This resistance is not a property in addition to the specific characteristic event which is a

rūpa dharma. It is just what ‘being blue here now’ or ‘solidity happening here now’ is. X occurring here now just is for nothing but X to be occurring here now. This wins Vasubandhu aggregation, collision and the avoidance of coalescence (or the collapse of the universe to a single point). But this is the most that Vasubandhu could hope to get from resistance-existence. No such argument can be made to account for the asymmetry inherent in opacity which gives three-dimensional aggregations their apparent depth.

IN CONCLUSION

Abhidharma atomism is so severe it takes even conceptual distinguishability to indicate non-simplicity. It thus faces the problem of contact in a particularly acute form. Vasubandhu recognizes that no attempt to resolve the difficulty by appeal to an unfilled void between atoms is adequate, because the problem of contact is only a crude form of the subtler problem of directionality – and directionality persists through gaps between atoms. Extension and numerical divisibility are irrelevant to the refined problem of directionality, for even extensionless points must be oriented with respect to each other, and these respects must be distinct from each other within each atom of an aggregate. Vasubandhu’s deft solution is to insist that at the metaphysical level, atoms do not coalesce or become partite because the occurring of a *rūpa dharma* just is its exclusion of other there and then. If we, considering several such *dharmas* together, determine to draw a relationship of ‘above’ or ‘below’ between them, then this is a matter of how we are conceiving things and does not impugn the simplicity of the atom itself. Thus ‘touching’ is what *we call* macro-objects that we perceive, or atoms that we conceive, as having no interval between them.

This elegant dissolution of the problem of directionality, however, cannot stretch to explaining opacity and shadow. Even dimensionless point-particulars must have genuinely distinct (if collocated) sides, one lit and the other not, if *rūpa dharmas* or their aggregations are to be perceptible. The real threat to atomism does not come from partition due to aggregation; the real threat arises rather from the perceptibility of the macro-objects that atoms were meant to explain.⁴⁷

APPENDIX: TEXT AND TRANSLATION OF ABHIDHARMAKOŚABHĀṢYA I.43D

Sanskrit text of AKBh. I.43d

(1) śeṣaṃ tu ghrāṇa-jihvā-kāyākhyam.

1.43d. trayam anyathā.

(2) prāpta-viṣayam ity arthaḥ. ghrāṇaṃ kathaṃ prāpta-viṣayam. nirucchvāsasya gandhāgrahaṇāt.⁴⁸ kēyam prāptir nāma. nirantarōtpattiḥ. (3) kiṃ punaḥ paramāṇavaḥ sprśanty anyōnyam āhosvin na. (4) na sprśanti iti kāsmīrakāḥ. kiṃ kāraṇam. yadi tāvat sarvātmanā sprśeyur miśrībhavayur dravyāṇi. atha eka-deśena sāvayavāḥ prasajyeran. niravayavās ca paramāṇavaḥ. (5) kathaṃ tarhi śabdābhiniṣpattir bhavati.

ata eva yadi hi spr̥seyur hasto haste 'bhyāhataḥ sajjeta upalaś ca upale. (6) katham citam̐ pratyāhatam̐ na viśīryate. vāyu-dhātu-saṁdhāritatvāt. kaścīd vāyu-dhātur vikiraṇāya pravṛtto yathā saṁvarttanyām̐ kaścīd saṁdhāraṇāya yathā vivarttanyām̐ iti. (7) katham̐ idānīm̐ nirantara-prāptyā prāpta-viṣayaṁ trayam̐ ucyate. tad eva eṣām̐ nirantaratvam̐⁴⁹ yan madhye nāsti kiṁcit. (8) api khalu saṁghātāḥ sāvayavatvāt spr̥śanti ity adosaḥ. (9) evaṁ ca kṛtvā ayam̐ api grantha upapanno bhavati vibhāṣāyām̐. kiṁ nu spr̥ṣṭa-hetukam̐ spr̥ṣṭam̐ utpadyate āhosvid aspr̥ṣṭa-hetukam̐ iti praśnayatvā āha 'kāraṇam̐ prati. kadācit spr̥ṣṭa-hetukam̐ aspr̥ṣṭam̐ utpadyate yadā viśīryate. kadācid aspr̥ṣṭa-hetukam̐ spr̥ṣṭam̐ yadā cayam̐ gacchati. kadācit spr̥ṣṭa-hetukam̐ spr̥ṣṭam̐ yadā cayavatām̐ cayaḥ. kadācid aspr̥ṣṭa-hetukam̐ aspr̥ṣṭam̐ yadā vātāyatana- raja' iti. (10) yadi paramāṇavaḥ spr̥seyur uttara-kṣaṇāvasthānam̐ syād iti bhadanta-vasumitraḥ. na spr̥śanti. nirantare tu spr̥ṣṭa-saṁjñā iti bhadantaḥ. bhadanta-mataṁ ca eṣṭavyam̐. (11) anyathā hi sântarāṇām̐ paramāṇūnām̐ śūnyeṣv antareṣu gatiḥ kena pratibādhyeta. yataḥ sapratighā iṣyante. (12) na ca paramāṇubhyo 'nye saṁghātā iti. ta eva te saṁghātāḥ spr̥śyante yathā rūpyante. (13) yadi ca paramāṇor digbhāga- bhedaḥ kalpyate spr̥ṣṭasya aspr̥ṣṭasya vā sāvayavatva-prasaṅgaḥ. na⁵⁰ cet spr̥ṣṭasya apy aprasaṅgaḥ.

English translation of AKBh. I.43d

(1) But as for the rest, called 'smell', 'taste', and 'touch':

I.43d. The three are otherwise.⁵¹

(2) That means that they attain their objects. In the case of smell, how is it that the object is attained? Because there is no grasping of an odour when there is no breathing in.⁵² What is this term 'attain'? Occurring without interval. (3) But do atoms touch one another or not? (4) The Kaśmīris say, 'they do not touch'. What is the reason? If they were to touch completely, things would coalesce. Then suppose instead that they were to touch at one spot. There would be the unwanted result⁵³ that they have parts – and atoms do not have parts. (5) Then how is there the production of sound? For that very reason. For if they were to touch, a hand that strikes at a hand, a rock that strikes at a rock, would become attached. (6) How does a heap that is struck not break apart? Because it is in a state of being held together by the air element (*vāyu-dhātu*).⁵⁴ A certain air element acts for the purpose of scattering, just as in the destruction of the world; a certain one for the purpose of holding together, just as in the creation of the world. (7) How in this case can it be said that the three [organs] attain their object by reaching without interval? There not being anything in the middle is indeed a state of non-interval for these [organs]. (8) Moreover, the statement that 'agglomerations touch because they have parts' is without error. (9) And supposing thus, this section in the *Vibhāṣā* is correct: Having asked the question 'Now does a thing-in-contact arise caused by a thing-in-contact or caused by a thing-not-in-contact?', it then answers: 'It depends on the cause. Sometimes, a thing-not-in-contact arises caused by a thing-in-contact when it breaks. Sometimes a thing-in-contact is caused by a thing-not-in-contact when it goes to a heap. Sometimes a thing-in-contact is caused by a thing-in-contact⁵⁵ when

heaps are combined. Sometimes a thing-not-in-contact is caused by a thing-not-in-contact, as when dust stays in the air.’

(10) Bhadanta Vasumitra says, ‘if atoms were to touch, they would stay a moment later’. Bhadanta says, ‘they do not touch; but there is a cognition of touch when they are without interval’. And the opinion of Bhadanta ought to be accepted. (11) For otherwise, were atoms to have space in between them, by what would their going into the empty intervals be restrained? For atoms need to have resistance.⁵⁶ (12) And it is not the case that agglomerations are anything other than atoms. Those very things [i.e. atoms] can be made an object of touch insofar as they are agglomerations, just as they can be made an object of perception. (13) And regarding atoms: if division according to directions is being supposed,⁵⁷ then there is the unwanted result that they have parts – whether they touch or not. If not supposed, then even when they do touch, there is no unwanted result.

NOTES

1. For an excellent overview of Vasubandhu’s contested biography and the full range of his philosophical contributions, see Gold (2018).
2. We are not well served for English translations of this central Buddhist philosophical text. The standard complete translation into English is by Leo Pruden (Berkeley, CA: Asian Humanities Press, 1988); but this is a translation from the French of the great Buddhologist Louis de la Vallée Poussin’s *L’Abhidharmakośabhāṣya de Vasubandhu* (1923–1931) translation from the Sanskrit. De la Vallée Poussin is not careful to translate the same Sanskrit term with the same French term, nor does he indicate when he chooses not to do so; and he often interpolates text, whether from commentary or supplying his own expansions, without marking them as such. These features are directly carried over into Pruden’s English translation. Accordingly, all quotations from this text are our own translation, unless otherwise noted. Our translation of the target passage of this discussion from Pradhan’s Sanskrit edition may be found in the appendix to this chapter.
3. Charles Goodman (2004) offers detailed philosophical examination along these lines. See also Siderits (1997, 455–78), and Ganeri (2001, 101–2).
4. The *Māhavibhāṣā* (*Great Compendium*), or *Vibhāṣā* for short, is a compilation of Abhidharma Sarvāstivāda debates. Each debate begins with a statement introducing the issue, followed by a compilation of the views and arguments from various Abhidharma scholars and anonymous sources. Among these scholars is Vasumitra, who is often endorsed by the *Vibhāṣā*. Vasubandhu often agrees with Vasumitra as well, though he disputes the *Vibhāṣā*’s understanding of Vasumitra (see Potter 1998, 111–19).
5. It is a mistake, however, to suppose (as Warder (1971) does and, following him, Goodman (2004)) that the rejection of substance-property metaphysics is a rejection of substance in every sense of it. *Substantia* translates the Greek *ousia*, and all subsequent philosophical discussion of ‘substance’ and its cognates inherits not only connotations of ‘standing under’, but also more centrally and ineliminably connotations of *being*, including individuation and identity. Being properly

individuated is crucial enough to substance for Aristotle to dismiss matter's claim to be substance – although it 'stands under' everything – on the ground that it is not an individual (a 'this-something'), in *Metaphysics* Z.3. And conversely, substance does not, as Goodman seems to think (2004, 397), require connotations of 'stuffiness' – indeed even for Aristotle (the father of substance-property metaphysics) what is most a substance, mostly completely a being, has no matter of any sort whatsoever.

6. Ronkin (2005, ch. 2) argues that this event metaphysics evolved out of an earlier process metaphysics.
7. It also relies on a clever argument about whether absences, or non-existents, can be caused by a presently existing thing.
8. In fact, the context for Vasubandhu's momentariness argument is an argument against the reality of motion.
9. Goodman (2004) rejects the atomist label for Vasubandhu's position on two misguided grounds. The first is the assumption that to reject substance as 'that in which properties inhere' is *eo ipso* to reject substances as discrete individuals with their distinct identities. *Dharmas* are well-individuated items and are moreover that of which everything large or complex consists. In these ways, *dharmas* do play the substance role in the same way Democritean atoms do. See note 5. The second ground Goodman offers for rejecting the attribution of atomism to this text is textual. We address this in notes 18 and 21.
10. *yatra bhinne na* tad-buddhir anyâpohē dhiyā ca tat. ghaṭâmbu-vat saṃvṛtisat paramârthasad anyathā* (AKBh. 6.4) – with Pradhan's instrumental '*bhinnena*' emended to a locative absolute and negation, '*bhinne na*' (Pradhan 1975).
11. Scade's (2013, 80–105) offers valuable discussion of the distinction made by the Stoics between divisibility according to real parts and mere in principle divisibility within a mass.
12. In *Metaphysics* A4, 985b6, Aristotle reports that the 'differences [between the atoms] are three – shape, arrangement and position' (KRS 555); Simplicius (*de caelo* 295) reports that the atoms 'have all sorts of forms and shapes and differences in size' (KRS 556, DK 68A37). Democritus seems to have thought there was a soul, but it is not clear he had a good atomist account of this. Was it an agglomeration or a single atom?
13. A quick defence of this principle would run along the lines: it is absurd to think that two (or multiple) things are one thing, although of course we can always *consider* many things *as* one (as for instance, with an army or a forest), if it is useful. All that is actually there are the several individuals, each of which is not any other but itself. As with the soldiers of an army, so with the properties of a conventional object: blueness and heaviness are two quite distinct things, and nothing can make them a single thing – except, of course, so considering them because it is useful; but this is no guide to reality (see Carpenter 2014, 35–47, for more detailed discussion). Democritus appeals to this thought – in Barnes' (1982, 269) translation of Simplicius, *de caelo* 295.11 (KRS 583, DK 68A37), 'It is absolutely silly to think that two or more things could ever become one' – though he does not pursue the point as thoroughly as Vasubandhu's metaphysics does. The Buddhists appealed explicitly (sometimes extensively) to the one-cannot-be-many principle in later texts (*Śāntarākṣita's Madhyamaka-Alaṃkāra* is a well-known case).

14. It has also been called a kind of reductionism (Siderits 1997, 2003) and a kind of fictionalism (Matilal 1970, 83–110, 93; Garfield 2006, 1–7; Siderits 2009; D’Amato 2013); see recent valuable discussion of both in Sauchelli (2016). These labels are not necessarily incompatible with characterizing the Abhidharma position as an atomistic trope theory. Any such categorization of the view must, however, be sure to accommodate the fact that Vasubandhu goes on here to insist that conventional reality is not *false* (‘So if one says, conforming to convention, ‘There is water’, ‘There is a pot’, one speaks truly and not falsely’, *AKBh.* VI.4). Ronkin (2005) offers insightful discussion of a range of evolving Abhidharma views in terms of atomism and momentariness.
15. In an appendix, Kapstein (2001b) offers a more recent and reliable translation of the whole of *Abhidharmakośabhāṣya* IX; discussion relevant to this point can be found in what he marks as section 4.
16. So at least runs Pruden’s bald translation. More accurately, the verse says, ‘It is not in the atom. [Comment:] Nor is shape or length and the rest perceived in the atom’ (*na ca annau tat. na ca saṃsthānaṃ paramāṇau vidhyate dīrghādī*). It is context – namely that the whole passage is arguing against the ultimate reality of length – that warrants Pruden’s (or rather de la Vallée Poussin’s) freedom here.
17. Goodman (2004) thinks that the absence of a similarly reductive argument for ‘derived form’ (molecules composed of atoms) implies that Vasubandhu takes such derived form to be ultimately real, and so he cannot be an atomist. According to Goodman, Vasubandhu thinks ‘tropes that are derived form really do exist; they are merely less fundamental than the basic physical tropes’ (the *mahā-dhātu*; 2004, 399). But the textual grounds for this interpretation are weak (see note 21). Vasubandhu’s own definition (*AKBh.* I.12ab) of the difference between primary (*mahat*) and ‘derived’ or ‘secondary’ (*upādāya*) specifies that it hinges not only on the former ‘supporting’ (*dhāraṇa*) the latter but also on what is primary having *svalakṣaṇa* (distinctive characteristic), later glossed as *svabhāva* (proper nature). But having *svabhāva* is tantamount to being ultimately real, so that Vasubandhu is effectively saying that primary elements differ from derived by being ultimately real. There is a further philosophical difficulty with Goodman’s account, for Vasubandhu has no vocabulary, nor conceptual space, for ultimately real things of varying fundamentality, which Goodman’s non-reductive trope theory would require.
18. *Contra* Kapstein (2001a, 191–4), who supposes that Vasubandhu had available to him (and presumably himself held in the *AKBh.*) only a ‘pre-modern minimal part atomism’ (191), we see that Vasubandhu himself must have supposed that non-mental *dharma*s were extensionless. Nor does Vasubandhu equate resistance with extension (2001a, 193–4), either in the *Abhidharmakośabhāṣya* or in his later *Twenty Verses* (the relevance of this will become evident in what follows), and there is therefore reason to doubt Kapstein’s further claim that ‘a cogent point-particle theory would mitigate severely the force of’ Vasubandhu’s later criticism brought to bear on his own atomist picture, if only he could have considered it.
19. Goodman (2014) takes Vasubandhu’s *paramāṇus* to be complex, not simple – molecules and not atoms at all. Coseru (2012, 80) agrees, taking this as a Sautrāntika view adopted by Vasubandhu: ‘the Sautrāntikas conceive the atom (*paramāṇu*) not as a substantial impartite entity, but rather as the subtlest collection of material elements (*rupasaṃghāta*) [*sic*]’. They both base this claim

on *AKBh.* 2.22. But this passage first of all attributes this use of the word ‘*paramāṇu*’ to another text, the *Kāmadhātu*; and then distinguishes the meaning of the word in that text from Vasubandhu’s own. ‘In *Kāmadhātu*, a *paramāṇu* which is without sound and without an organ is made of eight things (*dravyas*). Because it is completely minute, an aggregate of forms (*rūpa-saṃghāta*) is called “*paramāṇu*” – from which it should not be understood as the other one’ (*kāme ‘ṣṭa-dravyako ‘śabdaḥ paramāṇur anindriyaḥ. sarva-sūksmo hi rūpa-saṃghātaḥ paramāṇur ity ucyāte. yato na anyataro vijñāyeta. AKBh. II.22*). That is to say, the *Kāmadhātu* calls basic molecules ‘*paramāṇu*’, because they share with actual *paramāṇus* that they are tiny (and physically inseparable, see below); but they should not for this reason be confused with actual *paramāṇus*, discussed previously, which are not composed of several things. It is only after urging his readers to keep this caveat in mind that he takes up the *Kāmadhātu*’s use of ‘*paramāṇu*’ when talking about molecules. Saṃghabhadra confirms this construal. In his comment on this passage (*Nyāyānusāra*, quoted by Pruden 332, n. 95), Saṃghabhadra confirms that *paramāṇu* are simple, not divisible conceptually or physically; he then distinguishes between ‘*paramāṇu*’ (primary/ultimate unit) and ‘*saṃghātāṇu*’ (aggregated unit) and clarifies that the *Kāmadhātu* is actually talking about *saṃghātāṇu* when it says ‘*paramāṇu*’. The reason it is an ‘*āṇu*’ (unit) is because it is ‘not susceptible of disaggregation’ (even though it is not partless like *paramāṇu*).

20. Hereafter, ‘atom’ will be used specifically to designate *paramāṇus*, or *rūpa dharmas* – sensible property-particular events such as ‘this warmth here’ or ‘that blue there’.
21. *dravyāṇi*, namely the atoms themselves. Using the generic word ‘thing’ here picks up on the close association in Abhidharma thought between *dharma* and *dravya* (thing) to denote ultimately existing objects and the general association of fundamentally or ultimately real (*paramārthasat*) with substantially real (*dravyasat*).
22. Thus, on behalf of the Kaśmīris, Vasubandhu replies to the objection that without contact there would be no sound, by observing that *with* contact there would be no sound. In a world of atoms, contact would be tantamount to co-occupation of the same space – or coalescence; and coalescence cannot cause sound. ‘For if they were touching, a hand that strikes at a hand, a rock that strikes at a rock, would become attached’ (*AKBh* I.43d(5)).
23. There is, however, a way in which Vasubandhu could happily endorse the claim, by stressing that there is no error in *cognizing* that agglomerations touch. In fact, it is possible to read the Sanskrit as saying just that, since the particle of quotation ‘*iti*’ conveys that the claim in quotes is being thought or said by someone. And Vasubandhu would happily acknowledge the very same at the atomic level; see discussion below.
24. *keyaṃ prāptir nāma. nirantarōtpattih, AKBh. I.43d(2)*.
25. This might look as if the Vaibhāṣikas are perversely interpreting ‘without interval’ as ‘*with only* an interval’, for there is nothing but empty space between two atoms. Though *antara* consistently means ‘interval’, the prefix *nis-* can be read as either a negation or a strengthening particle. So, as Saṃghabhadra – Vasubandhu’s Abhidharma contemporary and rival – points out, *nir-antara* can mean ‘without an interval’, but it could also mean the opposite, ‘certainly having an interval’. Saṃghabhadra endorses this: ‘the word *nirantara* signifies ‘close’. The prefix

nis signifies ‘certitude’. As there is certainly an interval, the atoms are *nirantara*, ‘possessing intervals’. (*Nyāyānusāra*, quoted by Pruden 1994, 149, n. 191 (following de la Vallée Poussin), whose translation this is). We could, he goes on to say, take the *nir-* prefix to indicate absence, provided this is understood as absence of an intervening perceptible *dharma*.

26. This additional claim, that there is unfilled space between the atoms that are in non-separation, is not explicitly included here by Vasubandhu; but it is explicit in Saṃghabhadra’s defence of the view, and it is the aspect that will concern Vasubandhu when he critiques the position.
27. Though it may be too much to swallow, after all. If the agglomerations are after all only ‘in contact’ in some attenuated sense – not contact, but at an unfilled distance from each other – then there is no difference between distal and non-distal perception; both ‘attain’ their objects when there is nothing obstructing the intervening space between organ and object.
28. His worry, for the record, is that ‘if atoms were to touch, they would stay a moment later’ (*AKBh.* I.43d(10)). It is not clear to us exactly why this would be, nor how his solution addresses his particular worry. Unravelling this does not (so far) seem to bear on the Problem of Contact, nor Vasubandhu’s solution to it.
29. ‘the cognition’ renders *saṃjñā*, a word used in *five-skandha* analyses for mental events which can be true and false, as distinct from perceptions-sensations which are pleasant, painful and neutral.
30. In word (only), Vasubandhu’s Vaibhāṣika opponents agree; they claim the ‘no intervening body’ construal represents Vasumitra’s position. Technically, Vasubandhu is here disputing their reading of Vasumitra.
31. As quoted by Pruden 1994, vol. 1, 149, n. 191.
32. This will be more obvious in the Sanskrit where the neutral word for ‘direction’ is *digbhāga*, a compound word *dig-bhāga*, literally ‘direction-parts’. Pruden glosses ‘*digbhāga*’ as ‘spatial division’, which is not entirely accurate, and obscures the Problem of Directionality that Vasubandhu is introducing here (see below). It also risks seeming even more like a non-answer to the Vaibhāṣika worry than it already appears to be.
33. Stefan Anacker sees this correctly in his note on Vasubandhu’s *Twenty Verses*: ‘any atom’s being in a positional relation to another, implies that the atom has parts, and thus is not really an atom’ (Anacker 1984, 177, n. 15).
34. *AKBh.* II.55d, where Vasubandhu reiterates (in Pruden’s translation) that ‘What is called ‘space’ (*ākāśa*) is solely the absence of any tangible thing, that is, the absence of a resistant body. Persons say, in their obscurity, that there is space when they do not encounter any obstacle’.
35. *sapratighā iṣyante*, *AKBh.* I.43d(11).
36. The other is ‘breakability’ or liability to destruction and deterioration. The passage is difficult and inconclusive – an objection is brought which seems in its content to apply to the ‘breakability’ definition, but in its grammar to refer to the ‘resistance’ definition. Vasubandhu answers the objection, but it is unclear whether he does so in his own voice or whether he is here just offering the received answer to known objections.

37. *sapratighā daśa rūpiṇaḥ*AKBh. I.29bc.
38. *sva-deśe parasya utpatti pratibandha*, AKBh. I.29bc.
39. We make an effort to be careful with the formulation of this, for we would not want to commit Vasubandhu to the view that material *dharmas* have resistance as a property, for this would partition atoms just as surely as contact would. Vasubandhu is clear that ‘having resistance’ is nothing other than a property-occurrence precluding the co-occurrence of another. For further unpacking of this, see note 43.
40. *yathā hasto haste pratihanyate upale vā. upalo 'pi tayoh*, AKBh. I.28.
41. This basic conception of *rūpa* as resisting may also be implicit in Vasubandhu’s later canonical statement of the distinction between conventional and ultimate reality at AKBh. VI.4, where he offers *rūpa* as the prime example of non-conventional, ultimately existing reality: ‘For example, *rūpa*: if one breaks it into atoms, one can remember smell and other *dharmas* in the mind, but the comprehension of the nature of *rūpa* persists.’ One can dissolve any ‘material’ object (form, *rūpa*) into its constituent atoms; each atom would be *rūpa*, so that *rūpa* remains even after analysis bottoms out. Contrast this with water, which is not to be found in any of its constituents (liquidity, coolness, wetness). Each constituent atom of a *rūpa* macro-object remains itself *rūpa* – not ‘breakable’, as the first definition of *rūpa* at AKBh. I.13 has it, but resisting the existence of another perceptible quality, by being the occurrent perceptible quality it is.
42. And this might even be a more plausible interpretation of Vasumitra than the Vaibhāṣika interpretation. For it is unclear why we would cognize that these atoms touch when they are ‘without interval’ in the Vaibhāṣika sense. After all, ‘without interval’ in this case means that atoms are separated by space. It is strange to think that we would come to cognize that these atoms are touching when they are without interval in this way. We cannot defend this by claiming that atoms are tiny and the gap is small, causing us to perceive them as touching. For atoms are imperceptible – it is extended objects comprised of atoms that we see. Thus, this can only be meant in a conceptual sense, and here the Vaibhāṣika interpretation fails to explain why we would conceive that they are in contact when there is a space between the atoms. In Vasubandhu’s view, however, the presence of atoms at every dimensionless point would understandably cause us to cognize them as touching.
43. In fact, it is this later discussion of atoms and aggregation that is by far the better known among scholars. Stefan Anacker (1984, rev. 2005) offers a reliable and complete translation of verses and auto-commentary as well as the Sanskrit in an appendix. More recently, Das (2018) translates the *Twenty Verses*, though incompletely.
44. In the mid-twentieth century, some scholars also disputed the received view that the same person wrote texts in defence of these different positions (Frauwallner 1951). Broad, though not complete, consensus has settled on the view that they were indeed written by the same person (see Gold 2015), with some even going so far as to suppose that this person never endorsed the Abhidharma view he articulated in the *Abhidharmakośabhāṣya* (Kritzer 2003, 331–84 and 2005).
45. It is not clear, though probably relevant, what Vasubandhu thought light actually was. If it is just another atom, this will not help the atomist picture; and if it is not, what should it be instead?

46. See Carpenter (2014, 142–5) for analysis of the structure of the *Twenty Verses*, and Carpenter (2014, 147–50) and Kapstein (2001a) for discussion of its anti-atomist arguments.
47. We would like to thank participants of the Durham conference on the History of Atomism for discussion of the initial ideas behind this paper, and Ugo Zilioli in particular for the invitation which has led to such fruitful and interesting lines of inquiry, well beyond the scope of the current paper. Our thanks also go to David Brick and Malcolm Keating for their invaluable comments and exchanges on this translation, as well as to Ng Sai Ying for reading the translation for clarity.
48. It is grammatically ambiguous whether this compound should be taken as ‘*gandhā-grahaṇāt*’ (‘because there is the grasping of an odour’) or ‘*gandhā-agrahaṇāt*’ (‘because there is no grasping of an odour’). But the latter reading of the compound makes more philosophical sense, and Paramārtha and Xuánzàng’s Chinese translations, as well as Jinamitra and dPal brtsegs rakṣita’s Tibetan translation of the text all translate this line with the negation.
49. Pradhan: *niruttaratva*. Pradhan provides ‘*nirantaratva*’ as an attested alternative at 32n22, and we have corrected the text from ‘*niruttaratva*’ to ‘*nirantaratva*’ – ‘*niruttaratva*’ would mean ‘a state of having no superior’ rather than ‘a state of non-interval’.
50. Pradhan: *no*. We have emended ‘*no*’ to the negation ‘*na*’, which Pradhan provides as an attested alternative at 33n3.
51. The preceding line of the verse reads: ‘sight, hearing, and the mind do not attain their objects’. Skt: *cakṣuḥ-śrotra-mano 'prāpta-viṣayaṃ*.
52. Put simply, smell is said to attain its object because grasping an odour requires there to be breathing in. It is therefore rightly categorized under the non-distal senses.
53. The verb is ‘*prasajyeraṇ*’, which implies a negative or undesirable result.
54. *Vāyu-dhātu* roughly translates as ‘air element’ and is one of the four primary (*mahat*) elements which ‘support’ all other *rūpas* (AKBh I.12).
55. Pruden’s translation has this as ‘Sometimes a thing-in-contact arises from a *thing-outside-of-contact*, as when agglomerations come together’ (my *italics*, 121). Since the word here is ‘*sprṣṭa-hetukaṃ*’ and not ‘*asprṣṭa-hetukaṃ*’ with the privative *a-*, the italicized phrase should read ‘thing-in-contact’ rather than its negation.
56. The Sanskrit is ambiguous here between meaning (1) that atoms need to have (intrinsically) the characteristic of resistance or (2) that atoms need to have resistance from something else, that is, that they need to *be resisted* by something else.
57. Here, the verb translated as ‘being supposed’ is the passive causative *kalpyate*. Note that the root *klp* immediately suggests for the Buddhists the act of conceptual construction, and so the conventional reality of the thing being conceptualized – in this case, division according to directions.

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