EVERYTHING EXISTS: PLENITUDE, KINDS, AND PARADOX

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1. PLENITUDE

Quine was pulled two ways on ontology. He wanted most of the time to countenance just the objects that science sees fit to quantify over. By that standard, there is NOT such a thing as the "Eiffel Dollar" $=_{Df}$

> a physical object part of which is a momentary stage of a silver dollar now in my pocket and the rest of which is a temporal segment of the Eiffel Tower through its third decade (Quine [1976])

Why do I say scientists do not quantify over this putative object? If they did, they would be looking for an explanation of why it popped out of existence in 1919, turning up again in Quine's pocket at time t in the mid-1970s. They do not quantify either over the "Buckingham Dollar" $=_{Df}$

> the physical object obtained by summing the aforementioned t-stage of a silver dollar with the initial segment of Buckingham Palace extending up to (but not including) t.

For they maintain with Einstein that nothing moves faster than light. And the Buckingham Dollar would have to move ten times faster to get from England at t-ϵ to America at t, where ϵ is 1/10 the time it takes light to travel that distance.

And yet Quine in other moods does want to make room for objects like the Eiffel and Buckingham Dollars; "there are" in his view things like these. He believes in fact in objects comprising "the material content of any portion of space-time, however scattered and discontinuous" (Quine [1976]). Few of these count, to be sure, as *bodies*.

> Among the myriad ways, mostly uninteresting, of stacking up momentary objects to make time-extended objects, there is one popular favorite: the corporeal. Momentary objects are declared to be stages of the same body by considerations of continuity of displacement, continuity of deformation, continuity of chemical change. These are not conditions on the notion of identity; they are conditions on the notion of body. (Quine [1976])

Objects, even physical objects, range more widely than bodies:

> Despite men's stubborn body-mindedness, there are good reasons for the more liberal ontology of physical objects. All these objects, when I quantify over individuals, are the values of my variables. (Quine [1976])

Quine is attracted then to a *plenitudinous* ontology in which every material object up for recognition (subject to the stated restrictions) is recognized. *Every* thing of the right general sort exists, however foreign it may be to commonsensical or scientific thinking.

Not everyone is scandalized by this view. A lot of philosophers do not even find it surprising. What does seem slightly surprising is to find the view *in Quine*. Isn't it normally rationalists—Descartes, Leibniz, Spinoza, etc.—who want to "fill in the ontological gaps" by countenancing every technically eligible object (Lovejoy [2011])? Whereas Quine was as empiricist as they come. His critique in "Two Dogmas" was largely to the effect that empiricism (as then practiced) involved rationalist backsliding that ought to be rooted out (Quine [1951]).

Another reason for surprise is that the plenitudinarian impulse tends to be most strongly felt in mathematics (Manders [1989], Hintikka [1991], Ehrlich [1994], McGee [1997], Balaguer [1998], Baker [2002], Schiemer [2012]). And Quine is skeptical of mathematical plenitude (Maddy [1997]). He is willing to put up with

> indenumerable infinities only because they are forced on me by the simplest known systematizations of more welcome matters. Magnitudes in excess of such demands, e.g., beth-omega or inaccessible numbers, I look upon only as mathematical recreation and without ontological rights. Sets that are compatible with [Godel's axiom of constructibility] afford a convenient cut-off. (Quine [1986]: 400).

He is drawn, he says, to the "minimal natural model" of ZFC, a model in which all sets are constructible and the tower of sets is chopped off at the earliest possible point. This approach is "valued as inactivat[ing] the more gratuitous flights of higher set theory" (Quine [1990]: 95).

How is Quine's bloody-mindedness about sets to be reconciled with his welcoming attitude toward wildly gerrymandered concreta? He never really addresses this, to my knowledge. Not much is said, for that matter, even about the physical case—about the "good reasons" he sees for "the more liberal ontology of physical objects" (over and above chemically continuous bodies). He may think that ontological distinctions shouldn't be drawn arbitrarily or anthropocentrically. Are the cardinality-based distinctions he embraces in mathematics supposed to be more principled somehow than the continuity-based distinction between bodies and "mere objects"? I wish I knew; he leaves us guessing.[1]

[1] For the issue of arbitrariness in ontology, see Eklund [2009], Korman [2015], and Fairchild and Hawthorne [2018].

2. DE RE MODAL PLENITUDE

Quine exegesis is not our business here, nor are we especially interested in the types of plenitude (spatiotemporal, mathematical) just mentioned. What interests us is a further type of plenitude—modal rather than spatiotemporal— that Quine also mentions, if only in passing.

> What would be the analogous values of variables if one were to quantify over individuals in all possible worlds? Simply the sums of physical objects of the various worlds, combining denizens of different worlds indiscriminately. One of these values would consist of Napoleon together with his counterparts in other worlds, if 'counterpart' made sense; another would consist of Napoleon together with sundry utterly dissimilar denizens of other worlds. (Quine [1976])

This is very much the idea, but there is a problem with Quine's way of putting it. To speak of "sums" suggests that we are to think of the worlds and their contents as coexisting in the manner of Lewis's modal realism. And hardly anyone believes these days that "other" worlds exist taking the same concrete form as our own. Quine's formulation will not go down well, for instance, with actualists like Kripke and Stalnaker, or modalists like Prior and Fine.

An analogy may be helpful. Someone might try to explain spatiotemporal plenitude as the view that non-contemporaneous time-slices always sum to a further, time-extended, object.[2] Such an explanation is fine for four-dimensionalists, but will be found bewildering by, say, presentists, or eternalist endurantists. If one doesn't think of persisting things as

[2]Letting "time-slices" be as spatially gerrymandered as you like.

sums of instaneous entities in the first place, the idea that "all" persisting things are obtainable by summing them indiscriminately makes little sense.

How do we formulate spatiotemporal plenitude so as not to beg any relevant questions? We do it in multiple occupancy terms. There are a *number* of table-like objects before us, all coinciding right now with the table, whose pasts and futures are as various as you like. (The presentist might rather say that the facts about what the table-like objects were and will be doing are as various as you like.) "Various as you like" is subject to the constraint that none of these presently tabular objects was red yesterday unless yesterday, something was red.

Similarly in the modal case. Do not say, as Quine seems to, that Napoleon in this world can be summed with whatever world-bound objects you like in other worlds. Say rather that Napoleon coincides here with other items whose hypothetical properties (those speaking to what the item would or could have been doing, had history taken another course) are different. This much is known as pluralism or many-thing-ism. What plenitude adds is that these coincident items differ *as widely as possible* in their hypothetical properties. If modal profiles (transworld careers) are the modal analogues of pasts and futures, their modal profiles are as various as you like, subject to the constraint that an actual item is thus and so in w only if in w, something is thus and so.

How to make this precise is a good question. Let me just tell you how I once did it (Yablo [1987]) and propose to keep on doing it here.[3] The key is a certain notion of *categorical*

[3]For other approaches, see Fine [1999],Hawthorne [2006b], Johnston [2006], Leslie [2011], Inman [2014], Noonan [2015], Fairchild and Hawthorne [2018], and Fairchild [forthcoming]. This paper is closest to Leslie [2011].

property, standing to the modal dimension as intrinsicness and and occurrent-ness stand to space to time.

A property is intrinsic to x in w if x has it there in a way that is independent of what may be going on outside of x (Lewis [1983], Lewis [2001], Yablo [1999]). A property is intrinsic simpliciter if it can only be had intrinsically (Humberstone [1996]). A property is had occurrently by x at t, if x has it then in a way that is independent of what may be going on at other times. P is occurrent simpliciter if it can only be had occurrently. x has P categorically if x's possession of P is independent of what may be going on with x in other worlds, that is, of x's transworld career. P is categorical simpliciter if it can only be had categorically.

By a *categorical condition* in w, let's mean the combined categorical properties there of some y existing in w. A *modal profile* is an assignment Γ of categorical conditions C in w to some or all possible worlds w. Modal plenitude now becomes the claim that *each modal profile is instantiated*—I will assume uniquely— that is,

$\mathcal{P}$ **:** For each modal profile Γ, there's an object γ such that

(1) γ exists in precisely the worlds w on which Γ is defined,
(2) γ possesses, in each w, every property in $\Gamma(w)$,
(3) γ possesses no other categorical properties in w; and
(4) anything with the three features just mentioned is identical to γ.

3. WANTING EVERYTHING

Why go for de re modal plenitude ($\mathcal{P}$)? One can imagine lots of reasons in principle. Maybe we don?t want our ontology to be too anthropomorphic, or to make to too much of arbitrary seeming distinctions. Our motivation here is different. $\mathcal{P}$ offers a distinctive line of response, the claim is, to a number of problems in modal metaphysics:

(1) competition - the Ship of Theseus problem (Hughes [1997])
(2) flexibility - Chisholm's paradox of transworld identity (Chisholm [1967])
(3) duplicity - the Four Worlds paradox (Salmon [1986])
(4) grounding - what grounds coincidents' modal differences? (Bennett [2004])
(5) centrality - why are objects never found at the edge of their modal range?
(6) contingency - how can an identity-making property be contingent? (Almog [1991])

A word about each of these. The Ship of Theseus problem (section 5) concerns in the first instance identity over time. Is α the thing evolving from α's beginnings along a *spatiotemporally* continuous path, or the one evolving from those beginnings along a *materially* continuous path? Chisholm's paradox (section 7) and the Four Worlds paradox (section 8) concern identity across worlds. A thing maintains its identity through small cross-world changes, it seems, but not arbitrarily large ones. How can that be, when the cumulative effect of a series of small changes can be large? The Four Worlds paradox is in some sense the reverse of this. How can *two* things maintain their distinct identities, when they can be brought by small changes into complete qualitative agreement?

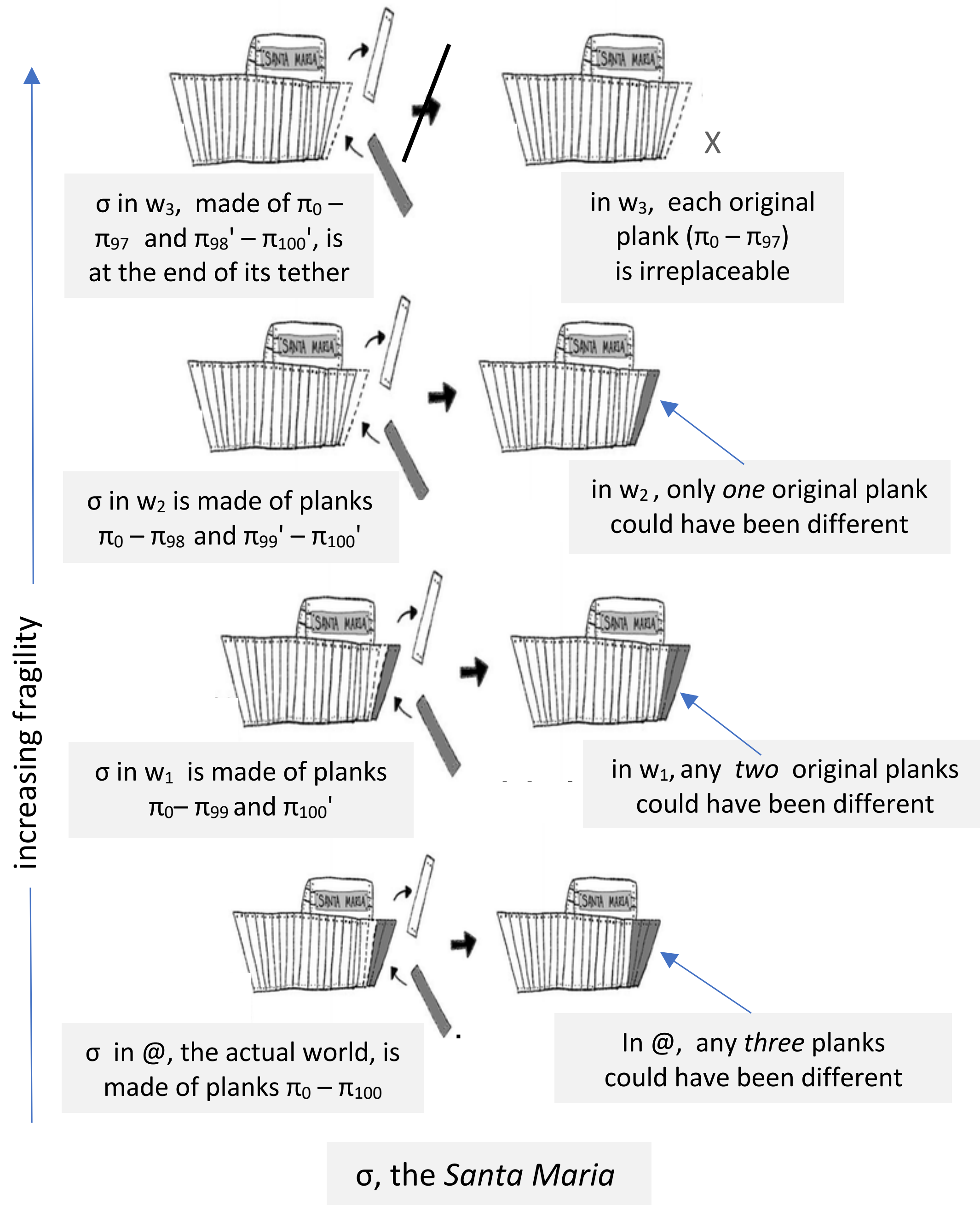
A tempting response to Theseus is to rethink Locke's principle that there can be only one thing of a given kind in a given region.[4] Allowing for two precisely overlapping ships involves us in an extreme form of pluralism (the multiple occupancy view, many-thingism). Pluralism, discussed in section 4, runs famously into the grounding problem (section 6). If two objects are categorically just alike, how do they come by their different persistence-conditions? You may say that a thing's persistence-conditions, and indeed all

[4]"For we never finding, nor conceiving it possible, that two things of the same kind should exist in the same place at the same time, we rightly conclude that whatever exists anywhere at any time excludes all of the same kind." (Locke 1975, II, 27)

its hypothetical features, are grounded in its *kind*. But what grounds the kind? And aren't Theseus's two "ships" of the same kind? Pluralists must find a way of addressing these issues, else we are driven back to monism (the single occupancy view, one-thing-ism).

The two remaining problems, centrality and contingency, are not as well known, so let's slow down a bit. Centrality goes like this. Material objects are supposed to be capable of departing only so far from their actual material origins. A ship could (grant me this!) have been made of planks differing by 3% from the ones that composed it originally, but not of planks differing from those originals by over 3%. But then, there should be the possibility of ships hanging on for dear life at the edge of their zone of tolerance. See the *Santa Maria* diagram below. Replace even a single plank, and the ship (e.g. σ in w_3 below) is no more.[5] Where σ sat in w_3, a distinct ship sits in w_4, or else w_4 is impossible.

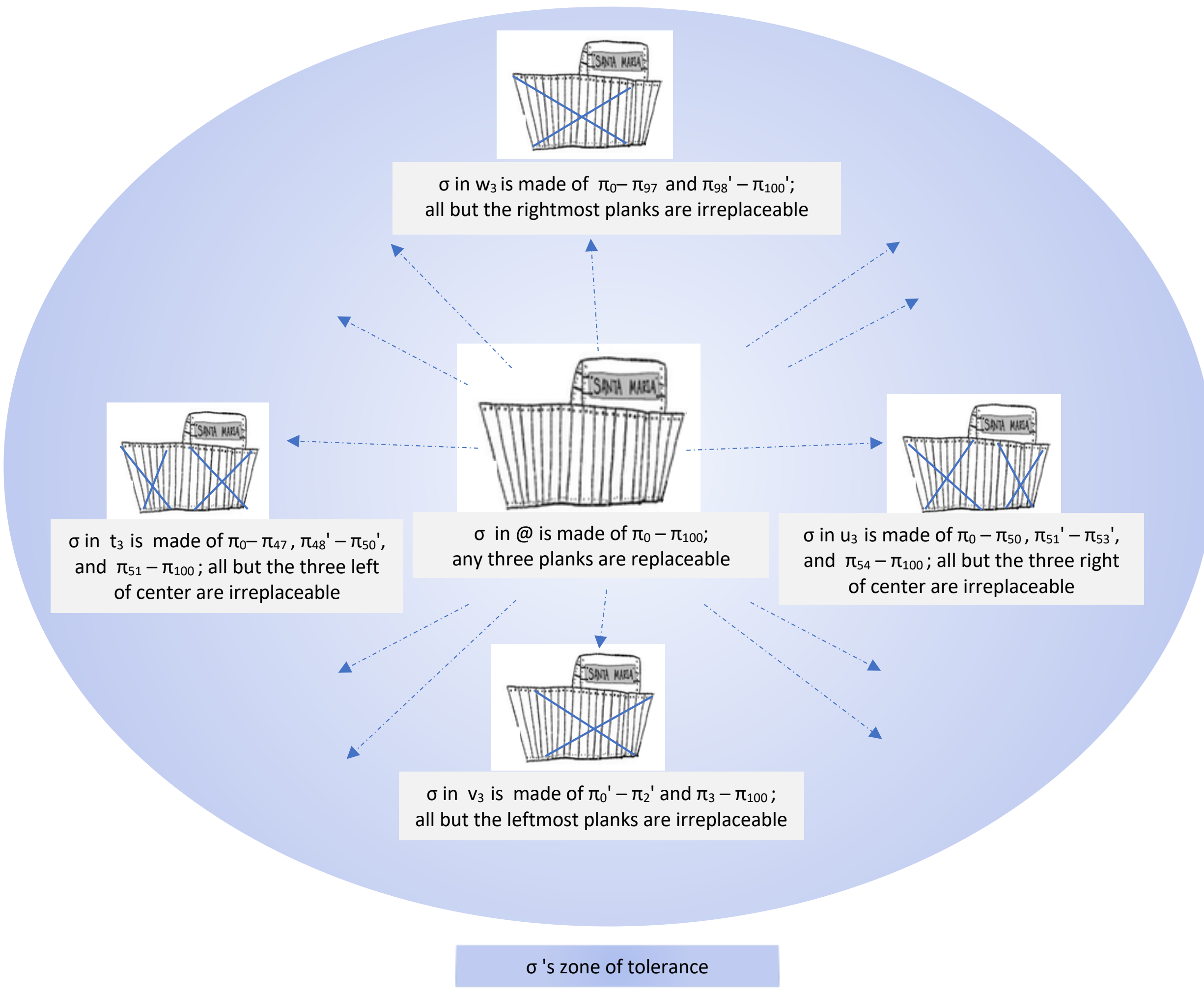
[5]Actually a few planks are replaceable; see the diagram.



And now further questions arise. Why do we never encounter objects this fragile (as fragile as σ in w_3) in actuality? Is it only counterfactual ships that hang onto their parts so tightly? Come to think of it, why are we speaking here of counterfactual "ships"? A thing the vast majority of whose planks are irreplaceable seems undeserving of the title. And yet we cannot easily withhold the title, for it is σ's ship-hood that gains it entry to worlds like w_3 in the first place.

Worse, there are going to be *lots* of these cliffside σ-worlds—almost a million if σ has a hundred and one planks (there are that many ways of choosing which three of the hundred and one to replace).[6] The ships in these 999,990 worlds are, like Tolstoy's families, each unhappy in their own way. All but the *right*most of its planks (numbers 98 to 100) are necessary to σ in w_3. All but the *left*most are irreplaceable in v_3 (see below). Other lopsided profiles are manifested in other worlds. In t_3, σ is willing to part only with the three planks immediately *left* of center. In u_3, only the three immediately *right* of center could have been different. And so on through a number (999,896) of possibilities still unmentioned.

[6]"101 choose 3" is $101 \times 100 \times 99 = 999{,}900$.



Two observations about these sorts of objects should be kept separate. One is that we don't tend to run into fragile ship-like objects *at all*. The other is that we especially do not encounter *one-sidedly* fragile objects, stretched to their limits, material-composition-wise, in some directions, but modally resilient in others.[7] Commonsense objects are, to stick with the spatial metaphor, *isotropically flexible*. The *Santa Maria* lives at the *center* of its

[7] Super-resilient, in fact. σ from w_3's perspective is made of planks differing by 6%, twice the permitted 3%, from the ones composing it in v_3. I take it that intuition recoils equally at the possibility of one-sidedly super-tolerant ships, and that of ships that are one-sidedly super-intolerant.

zone of tolerance, not off in some modal suburb. Why does it live off in the suburbs in other worlds? It is hard to think why our world would be so modally special.

The sixth and final problem is a corollary of this. Grant me for now that it is essential to commonsense objects to lie at (or near?) the center of their zones of tolerance. This clearly cannot be a property that they carry with them to the *edge* of their zones. But then centrality appears to be an essential property that is possessed only contingently. How is this to be reconciled with Fine's widely accepted claim (Fine [1994]) that a thing's essential properties are a proper subset of its necessary properties?

Six problems, then, with no agreed on solutions. If the principle $\mathcal{P}$ of modal plenitude provided a unified line of sight on these problems, that would be reason to take it seriously.

Another reason to take it seriously is that alternative responses are on the radical side. Chisholm's Paradox, for instance, is often taken to show that modal accessibility relations (aka relations of relative possibility) are intransitive; worlds that *could* have been possible may be impossible as matters stand. A common reply to Four Worlds is to treat these relations as asymmetric (Salmon [1986]). But then we must abandon the characteristic S4 axiom $\Box A \supset \Box\Box A$ (which rests on transitivity), and the B axiom $\Diamond\Box A \supset A$ too (it rests on symmetry). These axioms are otherwise highly plausible, however; they are definitive on many views of metaphysical (as opposed, e.g., to nomological) necessity.[8] The logical costs are lower, but still nontrivial, if we deny instead the transitivity and symmetry of transworld identity (Forbes [1984]).

Is there anything that might be done *metaphysically* to deal with these problems? Our first reason for taking plenitude seriously is that it is a metaphysical, non-logical, hypothesis

[8] Though see Salmon [1989].

that holds promise of helping with all of them. The second reason is that $\mathcal{P}$ provides the *only* answer I know of to certain of the puzzles, e.g. grounding and centrality. The third reason, already mentioned, is that it addresses all the problems a more or less unified way.

4. PLURALISM

Consider a statue, STATUE, and let CLAY be the piece or portion of clay that composes it. The two differ modally, since one can exist without the other. STATUE would not have existed, for instance, if CLAY had never caught the attention of any sculptor. Even where both exist, moreover, they can differ categorically:

> Suppose that just before 3PM, I break off STATUE's left hand, replace it with a new one, and throw the old one on the floor. CLAY is not wholly on the table at 3PM, for part of it is on the floor then:
>
> (a) CLAY is not wholly on the table at 3PM.
>
> But isn't STATUE wholly on the table at 3PM? If
>
> (b) STATUE is wholly on the table at 3PM
>
> is also true, then the Identity Thesis is false (Thomson [1998], 152).

The Identity Thesis is falsified by the mere possibility of a scenario like this. STATUE is still distinct from CLAY, even if they occupy in this world the same spatiotemporal region, as long as their spatiotemporal extents could have differed. They might be more indiscernible even than that, agreeing in texture, color, weight, appearance, and so on. STATUE is still distinct from CLAY, given their modal differences, even if they

> share all the same properties (of a certain kind!) with respect to the present world (Scott [1970], 165),

making them in this world

> equivalent or incident, [notwithstanding that] relative to other points of reference they may cease to be incident (Scott [1970], 165).

The usual term nowadays is "coincident," and the allusion (properties "of a certain kind") is to categorical properties. It is their categorical properties that α and β must share in a world to be coincident there. Their categorical properties are, again, the ones they possess independently of their paths through the rest of modal space. The reason they take different paths is that STATUE and CLAY are different *kinds* of thing.[9] It is the business of α's kind/sort to tease a complete modal profile out of α's this-worldly categorical character.

5. COMPETITION AND THE SHIP OF THESEUS

The ship of Theseus, as Plutarch tells it, had its original planks replaced one by one over a period of years. Hobbes (*De Corpore* (II, 7, 2)) imagines that the original planks are later reassembled elsewhere according to the same plan. We end up with two ships, one spatiotemporally continuous with the original but made of different matter, the other made of the same matter as the original but not evolving from it along a spatiotemporally continuous path. Which of these two is the ship of Theseus? No answer seems possible.

Consider a version of the case where the actual ship τ is destroyed (in a fire, say) before having any planks replaced. It could have happened, and does in counterfactual world v, that the original ship was not destroyed, and that everything proceeded as in the world w described by Hobbes. World v contains two ships, τ_1 and τ_2, both beginning as τ does

[9] Or of different *sorts*, in another terminology(Wiggins [1980]).

in w. But τ_1 evolves from that shared starting point in v through successive replacement of planks, τ_2 by reassembly of the old planks into a replica of the original. τ cannot, if the case is done right, be either τ_1 or τ_2. For why should it be *that* one and not the other? τ_1 cannot be both of them either, given that τ_1 is distinct from τ_2. We could say that τ fails to exist in v. But this seems a last resort, given that there are *two* things in v either of which would be τ in the other's absence. (How could a double success be a failure?)

Ah, but these are not the only options. One can reconceive τ as a *pair* of coincident ship-like items μ_1 and μ_2. μ_1 survives into v as τ_1; μ_2 survives into v as τ_2. (μ_i is plausibly the very same thing as τ_i, though we needn't insist on this.) If the two μs don't jump out at us as distinct, that is because they are categorically just alike. And there is a further factor as well. μ_1 is more easily lumped in with μ_2 than STATUE with CLAY, for STATUE is a different *kind* of thing than CLAY; and it is hard to think how μ_1 and μ_2 are to be classified if not (both) as ships.[10]

What about Locke's principle that there is at most one thing of a given kind exactly occupying a given spatiotemporal region? The fact that it "hard to think" how how μ_1 and μ_2 are to be classified if not (both) as ships does not really threaten this principle, from a plenitudinarian perspective. *Of course* ship-like objects are going to outrun our everyday sortal concepts, if they are as plentiful and finely discriminated as $\mathcal{P}$ says. To go by $\mathcal{P}$,

(a) the categorical properties C of any α in w can be drawn out into a plenitude of modal profiles Γ, all agreeing in their value on w (for each Γ, $\Gamma(w) = C$);
(b) for each profile Γ, there is a γ "playing the Γ role" in this sense: γ exists in exactly the ws in Γ's domain, and γ's categorical properties in w are the members of $\Gamma(w)$.

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[10] Hughes [1997].

Add to this that it is y's kind that determines its modal profile, and we get a plethora too of kinds, one for each modal profile pulled out of y's categorical character C in w. Small wonder if we don't have names for each of them (Hughes [1997] makes a start with *form-based ship* and *matter-based ship*). That kinds are so much finer-grained than sortal predicates is all the explanation one needs of why it is hard to think how (if not as ships) μ_1 and μ_2 are to be classified. Locke's principle is preserved to the extent that Theseus's two "ship"s are not of quite the same kind.[11]

6. GROUNDING AND THE SOURCES OF MODAL MULTIPLICITY

Suppose that items of different kinds, perhaps subtly different kinds with no good English names, can occupy the same spatiotemporal region. What makes μ_1 the thing of kind K_1 at that location, and μ_2 the thing of kind K_2, rather than the other way around? Their sortal and modal differences ought to be based in pre-sortal, pre-modal differences. And it is not clear how that is going to be possible, when they appear in lower level respects to be just alike. Here is how Karen Bennett puts the problem:

> What grounds the alleged modal differences between CLAY and STATUE, given that they are otherwise so alike? They are the same shape, the same size, made of the same parts, have the same history and future, are the same distance from the bagel store, and so on and so forth. So what exactly makes it the case that they could have different shapes, sizes, etc.? 'One-thingers', as I shall call them, suspect that their 'multi-thinger' opponents simply have no answer to this question. (Bennett [2004], 339-40).

[11] Not to say that all examples can be dealt with this way (Fine [2000]).

If the question is, in virtue of what do CLAY and STATUE have the sortalish properties that they do, "the multi-thinger has to answer, "in virtue of nothing at all." ...she has to claim that sortalish properties are primitive" (ibid, 341-2). This is apt to seem preposterous. Surely there is something which makes it CLAY, rather than STATUE, that survives being squashed flat, or divided into non-contiguous parts.

I agree that there *could* be something which makes it CLAY rather than STATUE, and on some views (e.g. qua-object-ism (Fine [1982])) there is. But the "surely" is unwarranted. Persisting through squashing might be part of what it is to be CLAY as opposed to STATUE. (Why is the letter 'a' written like that, and not like this: 'b'? It just is the letter written the first way.) Even if so, though, a problem arguably remains. Why do we get these two modal profiles *in particular*, granted that there is no deep mystery about how CLAY acquires the one and STATUE the other? The plenitudinarian has an answer: we *don't* get these two in particular. The fact is that

> every region of spacetime that contains an object at all contains a distinct object for every possible way of distributing 'essential' and 'accidental' over the non-sortalish properties actually instantiated there. A certain principle of plenitude holds; there is an object for each possible combination of modal properties.... And precisely because each region is full in this way, there is nothing in virtue of which any particular object has the modal properties it does. There is nothing special about CLAY in virtue of which it has that property and STATUE does not. It's just that *all the modal bases* are covered. (ibid, 354-5)

So here is a second gnarly-looking modal problem that has trouble getting off the ground if we say with the plenitudinarian that *everything* (a bearer for each modal profile) exists.

7. FLEXIBILITY AND CHISHOLM'S PARADOX

Objects do not have all their properties necessarily; they are modally flexible in certain respects. An α existing in world w is likely to persist into other worlds v where its properties are slightly (or more than slightly) different from what they were in w. How widely α's properties can vary is a function of its kind K. Statues as we have seen are open to different sorts of modal departures than hunks of clay.

Now suppose, as will often intuitively be the case, that Ks can survive "small" transworld changes but not "large" ones:

> If a chip, or molecule, of a given table had been replaced by another one, we would be content to say that we have the same table. But if too many chips were different, we would seem to have a different [table] (Kripke [1980], 51).[12]

This causes problems, as Kripke recognizes. What is to stop us from subjecting α, a K, to a series of identity-preserving transformations at the end of which α has suffered more modal insults than Ks can tolerate? Chisholm's version of the problem involves Adam turning, by a series of small transworld changes, into Noah, while Noah turns into Adam

[12] Salmon [1981] discusses these matters in more detail. Crucially the issue is transworld variation rather than transtemporal: "one should not confuse the type of essence involved in the question 'What properties must an object retain if it is not to cease to exist, and what properties of the object can change while the object endures?', which is a temporal question, with the question 'What (timeless) properties could the object not have failed to have, and what properties could it have lacked while still (timelessly) existing?', which concerns necessity and not time and which is our topic here. Thus the question of whether the table could have changed into ice is irrelevant here. The question whether the table could originally have been made of anything other than wood is relevant. Obviously this question is related to the necessity of the origin of the table from a given block of wood and whether that block, too, is essentially wood (even wood of a particular kind)" (ibid., 114-5).

by the same changes run in reverse (Chisholm [1967]). Like Kripke, though, we will focus on changes of material constitution (see also Forbes [1984], Salmon [1986]).

A material-constitution based modal sorites paradox can be framed in more than one way, but the following, adapted from Forbes, is a good place to start. We are given that

> σ is a ship, p_0 is the set of planks (numbered 0-100) from which the ship is actually made, and p_i is the set that results when the last i planks are replaced by planks drawn from elsewhere (e.g. p_3 consists of planks π_0-π_{97} and three "new" planks π_{98}'-π_{100}'). Then if Mxy is read as *x is constituted of exactly the planks in y*, we have
>
> **0:** $M\sigma p_0$
>
> **1:** $\Box(M\sigma p_0 \supset \Diamond M\sigma p_1)$
>
> ....
>
> **k:** $\Box(M\sigma p_{k-1} \supset \Diamond M\sigma p_k)$
>
> ....
>
> **100:** $\Box(M\sigma p_{99} \supset \Diamond M\sigma p_{100})$
>
> **101:** $\Box(M\sigma p_{100} \supset \Diamond M\sigma p_{101})$
>
> **So:** $\Diamond M\sigma p_{101}$

The conclusion here, that σ could have been made originally of entirely different planks, is plainly false. Small switcheroos may be tolerable, but a ship like σ, actually put together out of π_0-π_{100}, could not have been constituted originally by wholly distinct planks π_0' -π_{100}'.[13]

[13] As Kripke argues in Kripke [1980], 114. See also Salmon [1981], Appendix 1.

Where does the argument go wrong? Suppose as above that ships can survive replacement of 3% of their planks but no more. Then $\Diamond M\sigma p_4$ is false, for if planks 97-100 are replaced, we end up with *four* new planks out of a hundred and one, which is almost 4%. Now look at premise **4**: $\Box(M\sigma p_3 \supset \Diamond M\sigma p_4)$. Is it true in all worlds that $M\sigma p_3 \supset \Diamond M\sigma p_4$? Clearly not; the antecedent holds in w_3 (= the world witnessing the truth of premise **3**), while the consequent holds in no worlds.

This reply is somehow never discussed.[14] The reason might be that w_3 as we're now conceiving it is quite a strange place. It contains, in σ, a ship that cannot survive replacement of *even one plank* (unless very carefully chosen). Made in w_3 of π_0-π_{97} and π_{98}'-π_{100}', σ cannot be made in *any* world of an ensemble of planks with a new π subbed in for one of π_0-π_{97}.

The "new" is crucial because σ *would* survive, in w_3, the reinsertion for one of π_0-π_{97} of one of its *actually* original components π_{98} - π_{100}. But remember, π_{98} - π_{100} are just as foreign (in w_3) to σ as new-π is. Why in that case would putting new-π in for π_{97} be more of a threat to σ's identity than reinserting one of π_{98}- π_{100}? Are we to suppose that w_3 "knows" that w_0 is actual, and looks back to w_0 for guidance on the modal properties of its (w_3's) ships?[15]

Taking the perspective of w_3 helps to brings out edge-worlds' strangeness. Are the people there *aware* of their ship's one-sided inflexibility? σ does not look to *them* like an exile from actuality stretched almost to the breaking point. To hear the w_3-ers tell it, any of

[14] One might object to the idea of a sharp cutoff (3%), perhaps on the theory that modal sorites paradoxes should involve vagueness, like regular sorites paradox. I agree with Salmon that modal sorites paradoxes are in this respect different: "Considerations of vagueness ... do not yield a better solution [to the paradoxes], only something of a better understanding of the general phenomenon" (Salmon [1981], 241).

[15] Putting new-π in for one of π_{98}'-π_{100}' also does not result in a different ship, since ninety-eight of π_0-π_{100} are retained. It is again puzzling why should this be, when π_{98}'-π_{100}' are just as much part of σ in w_3 as π_0 - π_{97}.

σ's planks could have been swapped out pre-assembly for a plank taken from elsewhere, and the resulting ship would have been the same. This is just a mistake on their part, it would seem.

Let's review the supposed mistake more closely. The same old σ would result if σ's "last plank" π_{100}' were swapped out for new-π, since π_0 - π_{97}, constituting just over 97% of σ's actual original planks, would still be there. A ship distinct from σ would result, though, if it was π_{97} that was swapped out for new-π; a ship made of π_0-π_{96}, new-π, and π_{98}'-π_{100}' differs from σ (in @) by over 3%, which is more than a ship can tolerate.

And yet between these two scenarios — replacing the ninety-seventh plank with new-π to obtain a ship distinct from σ, or the ninety-eighth with new-π to obtain again plain old σ — the locals see no relevant difference.[16] How are they to know, and why would they care, if π_{97} was an original plank back in what w_0-ers call actuality, while π_{98}' was not? Awkward questions arise, their philosophers argue, not for them but us. They are not aware, as we see it, of exiles from w_0 hanging on for dear life in their world; but then we are not aware, as they see it, of exiles from w_3 hanging on for dear life in ours.

A view developed by Salmon (Salmon [1986]) sheds real light on these problems. σ may indeed be one-sidedly inflexible in w_3, from the perspective of w_0. But the effect goes away when we assume the perspective instead of w_3. (Possibility is world-relative; different things are possible in w_3 than w_0.) It is not *actually* possible, or possible *here*, for σ as constituted in w_3 to survive the replacement of π_{97} by new-π. But this sort of scenario would have been possible, had w_3 obtained, and σ's original planks been π_0-π_{97} and π_{98}'-π_{100}'.

[16]The locals are not of course different people; they are us in a different setting. Talk of what "they" see is talk of what we would see, had σ been made originally of slightly different planks.

Another way to put it is that worlds w_4-w_6, though not visible from here, making them impossible as matters stand, are just as visible from w_3 as w_1-w_3 are from here. Thus σ *would* have been isotropically flexible, just as it is in our world, had σ's original planks been π_0-π_{97} and π_{98}'-π_{100}', as in w_3. σ would indeed have been isotropically flexible *whichever* σ-world w had obtained. It is always true from w's perspective that any three of σ's planks could have been swapped out, preserving σ's existence, for planks external (in w) to σ.

Salmon's "recentering" idea softens the blow of σ's inflexibility in w_3. But in another way it seems only to push the problem back a step. Let it be that σ is never one-sidedly inflexible in w, from w's own perspective. But why should we not take the perspective of our own world @? Salmon does not deny, I think, that σ is *actually*, from the perspective of @, one-sidedly inflexible in w_3.[17] Nor does he deny that w_3 is accessible from @. Hence it is true even in our world that σ could have been (in nearly a million ways) such that nearly all of its planks, with three exceptions, were irreplaceable.

How is that kind of inflexibility even *possible* for a ship? If σ is of the relevant kind — if it is a ship — then σ does not just *happen*, you might think, to have a ship-like modal profile, it *has* to have one; to be modally "ship-shaped" is *necessary* to σ. This conclusion is inescapable if we accept

KIND NECESSITY: Things of the kind ship are necessarily of that kind.

KIND ISOTROPY: Necessarily, ships have a well-balanced, non-lopsided, modal profile.

Both principles are highly intuitive.[18] KIND NECESSITY follows on standard assumptions from *ship*'s being a genuine sortal, not a phase sortal like *fishing boat*. (It follows as

[17] Leslie [2011] makes a related point. He can deny this only by allowing σ's essence to vary from world to world, or else treating essences as somehow parametrized in terms of a floating actuality.

[18] See again Leslie [2011].

well from σ's being a ship by nature, if we agree with Fine that essential properties are possessed necessarily.) KIND ISOTROPY follows from

ACTUAL ISOTROPY: Ships have in @ a well-balanced, non-lopsided, modal profile.

KIND UNIFORMITY: Kinds fix modal profiles in a uniform way across modal space.[19]

If the mere *possibility* of ships most of whose parts are irreplaceable conflicts with KN and KI, this gives us reason to put accessibility approach aside for now, and see how far we can get just with plenitude. Ideally we'd like to solve these problems without weakening modal logic, and without departing further than necessary from modal common sense. The qualifier "further than necessary" is for two reasons. $\mathcal{P}$ is often accused itself of departing from common sense.[20] Also, we'll be revisiting and refining the stated conditions as we proceed, accepting them in some forms but not others.

8. DUPLICITY AND THE FOUR WORLDS PARADOX

The *Santa Maria* could have been made of π_0-π_{97} and π_{98}'-π_{100}', but not of π_0-π_{96} and π_{97}'-π_{100}' (this is why w_4 is impossible). π_0-π_{96} and π_{97}'-π_{100}' could have composed *a* ship, however; it is not as though they would have crumbled into dust were this attempted. Call the resulting ship ρ.[21] ρ cannot be σ—the *Santa Maria*—since σ is not constructible out of those planks. Likewise the world w^4 where ρ results cannot be w_4; w_4 by hypothesis has σ in it. The two worlds differ, we assume following Salmon, just in this one respect: the identity of the ship made of π_0 - π_{96} and π_{97}'-π_{100}'. This haecceitistic difference is important, though, as it makes for a difference in modal status. One of the worlds, w_4,

[19] Wiggins [1980].

[20] I don't myself think that the departure is all that great. The various ship-like objects are not *identical*, but as Kripke says, "mere non-identity may be a weak conclusion." See also Lewis [1993].

[21] Assuming for simplicity that there is a unique ship that would have resulted. This could be questioned.

is impossible, while the other, w^4, in which the planks compose ρ, could easily have obtained.

This already intriguing scenario becomes even more so if we bring in two further assumptions which, although not forced on us, seem not unnatural. One might expect it to hold *necessarily* in our world @ (= w_0) that combining π_0-π_{98} and π_{99}'-π_{100}' into a ship would yield σ.

(K) @ $\vDash \Box$ "Suitably combining π_0-π_{98} and π_{99}'-π_{100}' yields σ"

The resulting ship differs, after all, by less than 2% from the σ we know and love. Parallel reasoning from w^4's perspective suggests it ought to hold necessarily there that combining π_0-π_{98} and π_{99}'-π_{100}' into a ship would yield ρ.

(H) $w^4 \vDash \Box$ "Suitably combining π_0-π_{98} and π_{99}'-π_{100}' yields ρ"

Again, a ship made of π_0-π_{98} and π_{99}'-π_{100}' differs by less than 2% from ρ as it exists in w^4. We already have a world, viz. w_2, to witness the truth of "σ would result" as uttered in @. The truth of "ρ would result" as uttered in w^4 is witnessed, let's say, by w^2, which is (we can safely assume) a molecule-for-molecule duplicate of w_2. Given that the worlds contain the same molecules arranged in the same way, how can the one's ship (σ) be distinct from the other's (ρ)?

Salmon has a reply that complements his treatment of Chisholm's paradox. Since w^4 is possible, and "ρ would result" (henceforth R) holds necessarily there, R is in our world a *possible* necessity. Yet R is not actually the case, given the truth in @ of "σ would result" (S). Thus @ $\vDash \neg R$ & $\Diamond\Box R$. This runs contrary to the B axiom $\Diamond\Box A \supset A$, which suggests to Salmon that that axiom is mistaken and should be given up, along with the symmetry constraint on accessibility that B turns on. Actuality can see a world (w^4) where combining π_0-π_{98} with π_{99}'-π_{100}' is bound to yield ρ, though the result would *not* be ρ in @ itself. This would be a contradiction if w^4 could see @, so it can't, a violation of symmetry.

Earlier we asked whether denying transitivity really "solved Chisholm's problem" (section 7). Now our question is more basic. Before discussing whether the four worlds problem is solved by denying symmetry, we need to know what the problem is in the first place. All we have now is an oddity, that w_2 contains σ and w^2 contains ρ, though the two worlds are otherwise just alike. So far is this from presenting a problem that we can't say as yet the "two" worlds are distinct. (There is nothing odd about identical words being "otherwise just alike.") The alleged counterexample to B ($\neg R \& \Diamond\Box R$) hangs in the balance until this is clarified, since the case for $\neg R$ evaporates if w_2 contains ρ, as it must if $w_2 = w^2$.

Symmetry-denial certainly accomplishes something. It provides a way of reconciling $\neg R$ with $\Diamond\Box R$. But we are under to pressure to reconcile them only if we are under pressure to accept them. And while S is acceptable (σ is *a* ship that results if those planks are suitably combined), the argument from S to $\neg R$ assumes that things' composing one entity (σ) in a world prevents them from also composing another entity (ρ) there.

This assumption ought to trouble even the pluralist. If CLAY and STATUE are made up of the same molecules in @, why shouldn't σ and ρ be made of the same planks in u? But the plenitudinarian will reject it out of hand. She is already committed to the existence of objects coincident in u with σ whose transworld careers are otherwise as various as you like. And what is ρ if not an object coincident with σ in u while departing from it elsewhere? The departure in this case takes a particularly simple form. The two are coincident wherever they coexist. It is just that sometimes ρ exists without σ (in w^4, for instance), and sometimes (in actuality, for instance) σ exists without ρ.

But, you may say, CLAY and STATUE are different *kinds* of things, while σ and ρ are meant to be both ships. All Salmon needs is that the planks in question compose at most one ship in w_2.

This is the crux, I think. Two responses should be distinguished. One backs KIND UNIFORMITY over KIND NECESSITY. Though actually a ship, σ does not remain one in worlds like w_3 where its modal flexibility is compromised. KIND UNIFORMITY does not allow σ to be a ship in such worlds, since this would require a change in the modal upshot of ship-ness, given that σ is isotropically flexible in @. σ does not remain a ship even in w_2, since its flexibility is already compromised there. Neither would ρ be a ship in w_2, for precisely analogously reasons. That the planks compose at most one ship in w_2 cannot make σ and ρ identical, if neither is a ship in that world. This is the response I will mostly stick to in the main text.

The other response backs KIND NECESSITY over KIND UNIFORMITY. σ is a ship necessarily, but ship-hood has the expected modal upshot only in "home" worlds, like @ in the case of σ and w^4 in the case of ρ. A thing's modal profile in w is determined, not by its kind in w and categorical character there, but its kind simpliciter and categorical character in "home" worlds, e.g., the planks it was made of. On this approach there can be two ships in w with different modal profiles owing to differences in the reference world where profiles are set. ρ has a different zone of tolerance from σ despite their both being ships, because one has its profile set in w^4, the other in @.[22]

[22] These responses may be only notionally different because "ship" is said in more than one way (section 10). **SHIP**s satisfy KIND UNIFORMITY, but not KIND NECESSITY. $\mathbb{SHIP}$s satisfy KIND NECESSITY—they are $\mathbb{SHIP}$s

9. CENTRALITY AND TEETERING ON THE EDGE

The flat-footed response to Chisholm's paradox was this: one of the premises, $\Box(M\sigma p_3 \supset \Diamond M\sigma p_4)$, is just false, because $M\sigma p_3$ is possible (it holds in w_3), while $\Diamond M\sigma p_4$ is impossible (it holds in no possible worlds). The flat-footed response had, you'll remember, a bizarre seeming consequence. Are we really to think that w_3's ship is modally off-balance in a way that could in principle clue the locals in to their world's non-actuality? Of course they are not aware of their ship's strange modal properties. What experiment could reveal it? But this only seems to make matters worse.

The case for off-balancedness rests on two assumptions that need further scrutiny. Are the people in w_3 aware, we asked, of their ship's strange modal properties? σ is referred to here as "their ship," but this way of putting it begs certain questions. One thing we seem to be assuming is that

(EXISTENCE) σ is *a* ship in w_3.

It cannot be "their ship," if it is not a ship in the first place. To speak of "their ship" also assumes

(UNIQUENESS) there is at most *one* ship sitting in w_3 where σ is.

Otherwise we should have clarified which ship we had in mind, when asking whether the locals were aware of "their ship"'s surprising properties.

The assumptions are not unintuitive, but let's press on them a bit. What does seem clear, to start with (EXISTENCE), is that σ is a ship in w_0, and that its ship-ness in w_0 allows it to exist in w_3 as a composite of π_0-π_{97} and π_{98}'-π_{100}'. Does it follow that σ is a ship in w_3? To

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necessarily—but not KIND UNIFORMITY—the modal upshot of a thing's $\mathbb{SHIP}$-hood in w depends on its reference-world.

see why it doesn't, it helps to remind ourselves of Lewis's discussion of indeterministic laws in Lewis [1980].

Radium has a probabilistic half-life of 1600 years, which means that a certain kind of chance-y law holds: a newly minted radium atom is 50% likely to have decayed into radon by the 1600th year of its life. Lewis notes that it is possible (though fantastically unlikely), where this law is concerned, that every sample of radium winds up lasting the exact same length of time: 1600 years. But although the law allows this, he argues, we should not conclude that there is a world where it happens and the law still holds. For the laws would be different in that eventuality. Radium would be governed by the deterministic law that assigns it a fixed lifespan of 1600 years. The law allows, in other words, for behavior given which it would no longer be a law; it allows in his terms for its own "undermining."

Now, if this is possible for laws of chance, it might be possible as well for laws of possibility. The law governing σ here in w_0 entails the possibility of certain substitutions: any three of its planks could have been different. It is compatible with this that σ, in the nearest world w_3 where those substitutions have been made, is no longer subject to the any-three law—it is not amenable to further substitutions of the same type—even though that was the law that gave us w_3 in the first place.

Something will have to give if we say this. Perhaps σ, although a ship in w_0, is not *essentially* a ship. Or perhaps it is essentially a ship (ship-hood figures in its nature or real definition), but not *necessarily* a ship. And there might be other alternatives. Perhaps, despite what was said above, it is a ship all the same, but a kooky or "monstrous" one with a bizarre modal profile.

These possibilities will be explored below. The reason for putting them aside now is that rejecting (EXISTENCE) does not gain us much where the present problem is concerned. Suppose that our friends in w_3, when looking at σ, are looking at a non-ship (or an outré ship) at the end of its modal tether. Are they aware that σ is not a *normal* ship? It is hard to see how they could be, if it differs from a normal ship only in modal respects. ("Observation reveals that a thing is thus and so, but not that it could not be otherwise.") But then we are back in the same awkward spot as before, with a skeptical scenario that, although metaphysically possible on our assumptions, seems preposterous. There is just no chance whatever that the ship-like thing our friends are looking at is modally peculiar for reasons that none of them is in a position to appreciate.

The more debatable assumption here is (UNIQUENESS). Where is it written that there is only one ship-like thing there to be looked at, or that σ would stand out in the crowd, if a crowd it was? The plenitudinarian is on record as denying this. She thinks that a number of modal profiles are realized where σ sits, in addition to σ's own.[23] If there are a bunch of ship-like objects in the area, each with its own zone of modal tolerance, then to speak of σ as "their ship" is problematic. Why would our friends' attention be grabbed by σ in particular, as opposed to one of the other ship-like objects? Especially when one of those others is a *normal* ship with the kind of well-balanced modal profile we have come to expect.

The skeptical scenario bruited earlier becomes much less threatening, if there is *a* ship-like object present answering to conventional modal expectations. One might as well worry that we are thinking, when we do arithmetic, not of the natural numbers, but some

[23] Yablo [1987], Hawthorne [2006b], Leslie [2011], Asay [2013], and Inman [2014]. See Chihara [1994] among others for criticism.

other mathematical structure that arithmetic misdescribes. As long as the numbers are there, we can be forgiven for taking them to be the things whose properties settle the truth-values of our arithmetical thoughts and statements. As long as a (normal) ship is there, we can be forgiven for taking it to be the thing whose properties settle the truth-values of our thoughts about ships.[24]

10. KINDS OF KINDS

Of all the ship-like objects α coinciding with σ in a world w, only one, plausibly, is a *normal* ship, in this sense:

(a) α is *necessarily* ship-like; it has the right categorical properties not only in w but in every world where it exists

(b) α has the right kind of modal profile; it exists in a world v iff α's w-planks, give or take three, are put together in v as in w.

Only one of the αs coinciding with σ in w is, to say it briefly, of the kind **SHIP**. The **SHIP** will be σ itself if w is the actual world w_0, but not if w is w_3. The other αs are ships in some lesser sense. In fact there are several lesser senses.[25]

One step down from **SHIP**s are $\mathbb{SHIP}$s. A $\mathbb{SHIP}$ is like a **SHIP**, except we waive the requirement in (b) that w lies at the center of α's zone of tolerance. That zone must *have* a center, but it could lie elsewhere, back in actuality for instance. α is a $\mathbb{SHIP}$ in w iff

(a) α is *necessarily* ship-like; it has the right categorical properties not only in w but in every world where it exists

[24] This fits with things Hawthorne says in Hawthorne [2006b], and other papers in the same volume. Thanks to Jack Spencer for pointing this out.

[25] Thanks to Jack Spencer for urging these distinctions on me.

(b*) there is a world u such that α exists in v iff α's u-planks, give or take three, are put together in v as in u.

Though σ ceases to be a **SHIP** in w_3, at the edge of its zone of tolerance, it remains a $\mathbb{SHIP}$ there. For it is true even there that a world u exists (viz. w_0) in which σ is a **SHIP**. A **SHIP** in these terms is a $\mathbb{SHIP}$ at the *beginning* of its modal tether.

What else can be said about $\mathbb{SHIP}$s? Each $\mathbb{SHIP}$ is necessarily coincident, given plenitude, with at least one **SHIP**. We know from (a) that $\mathbb{SHIP}$s have the categorical properties of **SHIP**s. But anything with a **SHIP**'s categorical properties is by plenitude (principle $\mathcal{P}$) coincident with a **SHIP**. Therefore each $\mathbb{SHIP}$ is, in worlds where it exists, coincident with a **SHIP**.

What about the converse? Suppose an object α is coincident in each world where it exists with at least one **SHIP**; suppose for short that α is a $\texttt{SHIP}$. Must α then be a $\mathbb{SHIP}$?

The answer is no. Plenitude guarantees us a bizarro object 😉 that is coincident with σ (a **SHIP**, remember) wherever it exists, but is absent for some reason (better, for no reason) from w_2. 😉 is not itself a **SHIP** in any world, due to the strange gap in its zone of tolerance. But then it is necessarily not a $\mathbb{SHIP}$, for $\mathbb{SHIP}$s in effect are possible **SHIP**s. It follows that $\texttt{SHIP}$s, objects coincident where they exist with at least one **SHIP**, are a step down from $\mathbb{SHIP}$s, and two steps down from **SHIP**s.

But we have not quite reached bottom yet. Just below $\texttt{SHIP}$s are *SHIP*s, where to be a *SHIP* in world w is to be coincident in w with a **SHIP**. (*SHIP*s are what I was earlier calling "ship-like things.") The hierarchy then is

- **SHIP** — normal ship, with the right modal profile ((a) and (b))
- $\mathbb{SHIP}$ — thing with the right profile from *some* world's perspective ((a), (b*))

- `SHIP` — object coincident with a **SHIP** wherever it exists
- *SHIP* — object coincident with a **SHIP**

This four-way distinction frames the "essential contingency" puzzle, the last of those listed in section 2. I am going to approach it slightly different this time, by way of the notion of "modal undermining" (from section 9).

11. KIND AND ESSENCE

Our example of a `SHIP` that was not a $\mathbb{SHIP}$ was 😋, which is like σ except that 😋 goes missing in w_2. `SHIP`s are necessarily coincident with at least one **SHIP**, we said, and this applies to 😋 in particular. 😋 is coincident in the actual world, of course, with the **SHIP** σ. Does this generalize? Will 😋 in *all* 😋-containing worlds w be coincident with a **SHIP** in w by virtue of being coincident there with σ?

No. It is not that either side of the by-virtue-of claim is *false*. Go to any 😋-containing world you like, 😋 is coincident there both with a **SHIP** and with σ. But the postulated *connection* cannot hold. 😋 cannot be coincident in w_3 with a **SHIP** *because* of being coincident there with σ, for σ is not in w_3 a **SHIP**! The prima facie strangeness of this has been noted already (sections 8 and 9), but let's lay it out more clearly.

Fact 1: σ is actually a **SHIP**; it is a **SHIP** in the actual world w_0.

Fact 2: σ's **SHIP**-hood in actuality (in w_0) ensures its persistence into w_3.

Fact 3: σ's **SHIP**-hood does not need to persist into w_3, to get σ there.[26]

[26]As Moses did not need to enter the promised land himself, to get the Israelites there.

That σ does not have to be a **SHIP** in w_3 of course does not show it fails to be a **SHIP** there. But fail it does, if we want to hold onto KIND UNIFORMITY, for reasons noted in section 10.

Kinds on anyone's view play a role in determining persistence-conditions on the basis of categorical character. What UNIFORMITY adds is that they do it the same way throughout modal space. If actual **SHIP**s α are isotropically flexible, then to be of the kind **SHIP** in *any* world w, α must be isotropically flexible in w. This means, again, that take any three of α's w-planks you like, α could from w's perspective have existed without them, with three distinct planks in their place. To put it negatively, it conflicts with the intuitive notion of a **SHIP** that just certain size-3 ensembles, identifiable extrinsically by reference to worlds other than w, are replaceable in w (and that the permissible replacements too are subject to conditions coming from elsewhere).

If we think that kind properties should fix persistence conditions in *uniformly* across modal space, we will want truths of the form[27]

(A) $\Box_1$ (α is a **K** $\supset$ α can depart only so far from its 1-condition)

rather than

(B) $\Box_1$ (α is a **K** $\supset$ α can depart only so far from its w-condition)

where w is a variable whose value is set exogenously. The rule for **SHIP**s should look more like

(A*) $\Box_1$ (α is a **SHIP** $\supset$ α can vary by any ≤ 3 planks from its 1-ish material makeup)

than

(B*) $\Box_1$ (α is a **SHIP** $\supset$ α can vary by any ≤ 3 planks from its w-ish material makeup)

[27] Using here some hopefully comprehensible notation from two-dimensional modal logic.

Given that σ cannot in w_3 survive the replacement of even *one* π_i ($0 \leq i \leq 97$) with a new plank, σ cannot by (A*) be in w_3 a **SHIP**. Parallel reasoning suggests that σ would not have been a **SHIP** had it been made originally of *any* planks other than π_0 - π_{100}.

12. CONTINGENT ESSENCE

So we end up with a sort of mereological fragility. But not the usual sort. Philosophers like Butler and Chisholm hold that σ would not have *existed* had even one other plank been employed instead. That is not the contention here.[28] σ still *exists*, the claim is, but not as the same kind of thing; it is not any longer a **SHIP**.[29]

How objectionable should we find it if **SHIP**s are only contingently **SHIP**s? Not all properties are had necessarily, of course. But **SHIP**-hood is supposed to be a genuine sortal; and a thing's genuine sortal properties are possessed necessarily on standard views. "[I]f the very block of wood from which the table was made had instead been made into a vase, the table never would have existed. So (roughly) *being a table* seems to be a [necessary] property of the table" (Kripke [1980], 114).[30]

Before committing ourselves on this question, we should recall Fine's distinction between α's *nature* or *essence*, as set out in its real definition, and its necessary properties, the properties that α cannot exist without. That a thing's sortal character should figure in its real definition seems clear; σ is by definition the **SHIP** made originally of thus and

[28] But see the APPENDIX.

[29] The Butler/Chisholm view follows if **SHIP**s are necessarily **SHIP**s; but we found reason in sections 9-11 to think that they are only necessarily $\mathbb{SHIP}$s. Each **SHIP** (σ, for instance) is necessarily *coincident* with a **SHIP**, and *possibly* identical to a **SHIP**. But no **SHIP** is, on our story, *necessarily identical* to a **SHIP**.

[30] See also Wiggins [1980] and the ensuing literature.

such planks.[31] To get from this to the conclusion that σ is necessarily a **SHIP**, one needs a second and more debatable Finean idea.

Fine holds both that (i) essential truths always hold necessarily, and (ii) necessary truths always derive from essential truths. A lot has been written about (ii), Fine's "reductionism about necessity." Our question concerns (i), the necessity of what is essential. That σ is a **SHIP** looks for all the world like an essential truth about σ that no longer holds in worlds like w_3 where σ is at the end of its modal rope. σ certainly still exists in w_3 — this is ensured by its **SHIP**-hood in w_0 and the fact that **SHIP**s can tolerate replacement of any three planks — but it cannot for that very reason be a **SHIP** in w_3; it cannot there survive the replacement of even one further plank. σ cannot be a **SHIP** in w_3, because it is hanging by a thread there, after the loss of π_{98} - π_{100}. **SHIP**s are modally robust, so whatever is hanging by a thread in w is not a **SHIP** in w. To be a **SHIP**, then, is both essential to σ and a property it can exist without.

Denying that essential truths have to hold necessarily lets us acknowledge the modal *power* of kind properties (they fix crossworld persistence conditions) without assigning them a lofty modal *status*, that of attaching necessarily. The power in fact precludes the status, since since σ's persistence conditions change as we approach the edge of its modal range.

A second essential property of σ, in addition to being a **SHIP**, is being made originally out of thus and such planks. Which ones? The ones it *was* made of, presumably. A tempting definition therefore is

[31] No doubt we should add something about the ship's design, its creator, its "era" to cover cases of recycling and recurrence, and so on. I propose to ignore all that here. See McKay [1986], Forbes [1994], and Hawthorne [2006a].

(D1) $\sigma =_{Df}$ the **SHIP** made originally of planks π_0-π_{100}.

Since σ could have been made of different planks, we appear to have in its actual composition (π_0-π_{100}) a second defining feature of σ that it can exist without.

Someone concerned to preserve the essence-necessity link may see an option here that was not available with σ's property of being a **SHIP**. They might propose that the proper definition is not (D1) but

(D2) $\sigma =_{Df}$ the **SHIP** made of 101 planks including at least 98 of π_0-π_{100}.

Which of the two proposed definitions is preferable? (D1), I think. (D2) would not occur to us unless we had an eye already on σ's modal properties, and were trying to reverse-engineer a definitional basis for them. This seems backwards. Essence is supposed to be *prior* to necessity.

Another problem is that the essential properties laid out in (D2) underdetermine σ's modal properties. Compatibly with (D2), σ could be the **SHIP** made of π_0 - π_{97} and π_{98}' - π_{100}'. But a **SHIP** made originally of those planks could also have been made originally of π_0 - π_{96} and π_{97}' - π_{100}'. And σ could not itself have been made of π_0 - π_{96} and π_{97}' - π_{100}'. To be made originally of π_1 - π_{100}, give or take only three, is a necessary feature of σ that is recoverable from (D1) but not (D2). I conclude that we do better to stick with (D1), which means counting σ's actual original material makeup essential to it even though it is not necessary.

Suppose I am right that it is definitive of σ to be a **SHIP**, indeed the **SHIP** made of π_0-π_{100}. That is obviously a problem for the thesis that definitive (or essential) properties can only be had necessarily. A fallback thesis suggests itself. σ's definitional properties are not necessary to it full stop, but they are necessary to it qua **SHIP**. In every world where σ remains a **SHIP**, it is the **SHIP** made of precisely those planks.

Some of our modal intuitions about **SHIP**s might be explainable away as "really" intuitions about the modal properties of **SHIP**s qua **SHIP**s. This seems all the likelier if we were under the impression that a **SHIP** α is necessarily P iff it is necessarily P qua **SHIP**, as a result of thinking that **SHIP**s remain **SHIP**s in all the worlds that contain them.[32]

13. ACTUAL-WORLD REAL DEFINITIONS

A new perspective will be needed on real definitions, if α can exist without the properties that define it. Almog comes up against similar issues in his own work on essence. He too wants to allow for properties that pertain to a thing α's nature in @ without following it into every w where α exists. He appeals like Kripke to the "unimaginability" of α lacking the property. But "imaginability" is not used in the sense we are used to from Kripkean modal epistemology (Yablo [1993]).

To say that we cannot imagine α without F means, for Almog, not that we cannot think of a *counterfactual* item as α if it is stipulated not to be F, but that we cannot think of an *actual* item as α when F is "subtracted" or supposed not to apply. It is F's actual-world undeniability that marks a property as definitive of α or a condition of α's existence.

> Conditions of existence are meant to resist [*this*-worldly] subtraction experiments, not refutations in arbitrary counterfactual worlds; they state, not

[32]This theme is taken up again in section 14. The "qua" suffix might be taken to bear either on the referent or on the interpretation of surrounding predicative material (Fine [1982] takes the first approach, Lewis [2003] the second). Here I am thinking in predicative terms; but section 14 and the Appendix go referential. (See Loets [forthcoming] for discussion.)

> what it takes for x to exist in an arbitrary possible world, but what is a sine qua non for x's existence in the actual world (Almog [1991], 230, my italics).

This seems to fit the case of σ and its planks fairly well. A ship must originally be made of *these* planks, the ones that actually first composed it, if it is to be our σ. That σ was made of them in particular seems like a paradigm of the class of "propositions that are modally contingent but have actually to hold, if [a certain entity] is actually to be" (loc. cit.).

Some perspective may be helpful. We have known for a long time of claims that must actually hold given the meanings of their component expressions, where the "must" speaks not at all to what would or could have been the case. *The tallest mountain = the actually tallest mountain* has got to be true, for instance, given what it means to be actual (Zalta [1988]). But it does not have to be necessarily true and in fact it isn't. K2 would have been taller if certain tectonic plates had folded differently, in which case the tallest mountain (K2) would not have been the actually tallest mountain (Everest).

Here the guarantee is issued by a non-referential expression ("actually"). But it can also be issued by terms, as in Evans's example of Julius inventing the zip, or Dummett's *St Anne was the mother of Mary*. Why should it not also be issued by terms in virtue of their referential meanings? Say I am pointing at the *Santa Maria*. Then it has got to be true that *This is the ship made originally of such and such planks*, given just the identity of the demonstrated item. It is definitive of, or essential to, σ to be made of those planks, because it is *their* being thus and so combined that made a certain point in world history the point at which σ came into existence.[33] Nothing follows about the truth of *Necessarily,*

[33] Compare Yablo [1992] on world-driven vs effect-driven causes. The latter are tailored to the effect e's needs or requirements. Implementational details in whose absence e would still have occurred are by and large excluded. Sometimes though we want to know how this world in particular contrives to meet e's needs. Then it is world-driven causes we're after. Finean essences are like effect-driven causes in excluding

this ship was made originally of those planks, or hence about the ship being made of π_0-π_{100} in every world where it exists.

14. NECESSITY QUA **K**

One theme of this paper is the need to distinguish "rich" kinds like **K** from "poorer" kind(s). Yablo [1987] in a similar vein distinguishes *classifying* kinds, which are modally consequential, from *characterizing* kinds, which may not be. α counted as K if and only if it was coincident with something of kind **K**. To K and **K** we have added α's "absolute," world-insensitive, kind $\mathbb{K}$, and a weaker sort of world-indifferent kind $\mathtt{K}$. To be $\mathbb{K}$ is to be of kind **K** in some world or other. To be $\mathtt{K}$ is to be necessarily coincident with some **K** or other. (σ is still a $\mathbb{SHIP}$, and a $\mathtt{SHIP}$, even in worlds like w_3 where σ is, as we keep on saying, at the end of its modal rope.)

Once these distinctions are drawn, we see how certain of α's properties (say, the property P of being made of such and such planks) may be contingent without this jumping out at us.

> 1) The reason P *seems* necessary to α is that α is necessarily P as long as it remains a **K** — P is necessary to α qua **K**.
>
> 2) That P is necessary to α qua **K** makes it look like P is necessary to α, because "necessary to α qua **K**" is easily confused with "necessary to α."
>
> 3) These two are easily confused because α seems necessarily **K**.
>
> 4) α seems necessarily **K** because

factors that α could have existed without; this is why α's Fine-essential properties are necessary. How our world in particular contrives to meet α's existence-conditions is, by contrast, a contingent matter. I find it helpful to think of Almog-style essences as speaking to the second, how-it-happened-here, question.

(a) α is $\mathbf{K}$ by definition, and

(b) α is necessarily coincident with a $\mathbf{K}$.

The invited inference in (4a) relies on the essence/necessity link which is being called into question. (α's $\mathbf{K}$-hood has modal consequences, all right, but necessarily $\mathbf{K}$-hood is not among them.) The invited inference in (4b) turns on our attention being drawn to a world's normal Ks, not the modally monstrous weirdo Ks postulated by plenitude. And the normal K where α is, though categorically indiscernible from α, is unlike α a $\mathbf{K}$.[34]

So, to review. A $\mathbf{K}$ in w is a K everywhere, which means, given plenitude, that it is necessarily *coincident* with a $\mathbf{K}$. This makes it a necessary K, what we have called a $\mathtt{K}$. A $\mathbf{K}$ in w is also a $\mathbb{K}$ everywhere; for assuming symmetry, it is everywhere a possible $\mathbf{K}$. A $\mathbb{K}$ in w is everywhere a $\mathtt{K}$, and likewise $\mathtt{K}$s in w are everywhere Ks. But a K in w may be a non-K in v, and a $\mathbf{K}$ in w a non-$\mathbf{K}$ in v. We get all in all the following table, in which "yes" in cell *m/n* signifies that a thing of the *m*th sort of kind, has got to be, in every world that contains it, of the *n*th sort of kind as well.

	$\Box K$s	$\Box\mathtt{K}$s	$\Box\mathbb{K}$s	$\Box\mathbf{K}$s
necessarily, Ks are	✗	✗	✗	✗
necessarily, $\mathtt{K}$s are	✓	✓	✗	✗
necessarily, $\mathbb{K}$s are	✓	✓	✓	✗
necessarily, $\mathbf{K}$s are	✓	✓	✓	✗

Now let $\hat{K}$s ($\hat{\mathtt{K}}$s, $\hat{\mathbb{K}}$s, $\hat{\mathbf{K}}$s) be "K qua K"s ($\mathtt{K}$s qua $\mathtt{K}$s, etc), where β is a K qua K ($\mathtt{K}$ qua $\mathtt{K}$, etc) if it is obtained from α, a K ($\mathtt{K}$, $\mathbb{K}$, $\mathbf{K}$), by restricting α to worlds where α remains a K ($\mathtt{K}$, $\mathbb{K}$, $\mathbf{K}$). Then we get the following chart:

[34] It is hard to keep your eye on the **BALL** in a counterfactual world w, when that **BALL** is eclipsed in w by something more emblematic of its type.

	$\Box K$s	$\Box \mathtt{K}$s	$\Box \mathbb{K}$s	$\Box \mathbf{K}$s
necessarily, $\hat{K}$s are	✓	✓	✗	✗
necessarily, $\hat{\mathtt{K}}$s are	✓	✓	✗	✗
necessarily, $\hat{\mathbb{K}}$s are	✓	✓	✓	✗
necessarily, $\hat{\mathbf{K}}$s are	✓	✓	✓	✓

Rows 2 and 3 are unchanged since $\mathtt{K}$s ($\mathbb{K}$s) are by definition $\mathtt{K}$s ($\mathbb{K}$s) in every world they inhabit, making them no different from $\mathtt{K}$-qua-$\mathtt{K}$s ($\mathbb{K}$-qua-$\mathbb{K}$s). Row 1 has two new ✓s. The first simply reflects the fact that α qua K (obtained by restricting α to worlds where it is K) is automatically $\Box K$. The second ✓ on row 1 is because $\hat{K}$s are $\Box K$, and whatever is K in a world is (by plenitude) coincident there with a $\mathbf{K}$. The new ✓ on row 4 reflect that a $\mathbf{K}$ restricted to worlds where it retains that status is going to be a $\mathbf{K}$ in the worlds it still inhabits. Note that each sort of kind has a distinctive "signature" on one chart or the other. K ($\mathtt{K}$) is uniquely ✗✗✗✗ (✓✓✗✗) on the top chart; and $\mathbb{K}$ ($\mathbf{K}$) is uniquely ✓✓✓✗ (✓✓✓✓) on the bottom chart.

15. SOLUTIONS

Six de re modal puzzles have been considered. Plenitude appears to help with all of them. Let's assume first the KIND UNIFORMITY-favoring version that we have been focussing on in the main text, according to which σ does not remain a **SHIP** in worlds where it becomes modally inflexible and/or modally lopsided.

Our reply to THESEUS is that we don't have to choose. Both ship-like objects exist, one evolving by material continuity and one by spatiotemporal continuity. Indeed ship-like objects exist answering to all ways of trading off these and other factors.

Our reply to CHISHOLM is that σ becomes less and less a **SHIP** as it drifts away from actuality; its compositional flexibility suffers as it becomes less and less a **SHIP**.

Our reply to FOUR WORLDS is that we don't have to choose. The same planks can constitute either σ, or ρ, or both simultaneously.

Our answer to GROUNDING is the same as Bennett's: no explanation in categorical terms is to be expected, if all the modal bases are covered.

Our response to CENTRALITY is that one-sidedly inflexible ship-like objects are found in *every* world, not only worlds where actual **SHIP**s are at the end of their modal ropes. If we don't pay these modal monsters much notice, that is because they coincide with **SHIP**s better answering to our modal preconceptions.

Our response to CONTINGENCY is that while σ's definitionally essential properties have to hold in its "home worlds," where it remains a **SHIP**, σ exists too in "away worlds," and there its definitionally essential properties (not least **SHIP**-hood) may cease to hold.

Something should be said about the intuitive costs of allowing the *Santa Maria* to lose its **SHIP**-hood in certain counterfactual worlds. Why would σ even seem to be a **SHIP** necessarily, given that its **SHIP**-like modal profile gradually gives way as planks are replaced? That something has *got* to be the case can sometimes mean that it must *actually* be the case, as opposed to counterfactually. No matter which world w is actual, the *Santa Maria*, assuming we are not too far wrong about its categorical character, is a **SHIP** in w. (No matter which world is actual, heat is something that feels a certain way.) This does not at all imply that it could not counterfactually speaking have failed to be a **SHIP**. (Just as the point about heat does not imply that heat could not counterfactually speaking have existed unfelt.)

If one wants to insist that the *Santa Maria* is necessarily a ship, this can be arranged by taking "ship" to mean $\mathbb{SHIP}$. KIND NECESSITY is satisfied because $\mathbb{K}$s are $\Diamond\mathbf{K}$s, and $\Diamond\mathbf{K}$s are $\Box\Diamond$**K**s (assuming our modal logic is S5). KIND UNIFORMITY is not satisfied, however. A $\mathbb{K}$'s modal profile turns on its categorical properties in worlds where it is not only a $\Diamond$**K** but a **K** full stop.

Our reply to THESEUS is the same as before: both ship-like objects exist, one evolving along materially continuous lines, the other along spatiotemporally continuous lines.

Our reply to CHISHOLM is that although σ remains a $\mathbb{SHIP}$ (a $\Diamond$**SHIP**) as it drifts away from actuality, its compositional flexibility suffers nevertheless. This is because flexibility is judged not relative to worlds where it is only possibly a **SHIP**, but those where it is a **SHIP** in fact.

Our reply to FOUR WORLDS is that we don't have to choose. The same planks can constitute either σ, or ρ, or both simultaneously. The difference is that they can constitute both simultaneously notwithstanding that both are ships ($\mathbb{SHIP}$s); one possible **SHIP** can coincide with another provided their modal profiles are set in different worlds (the ones where they are respectively **SHIP**s).

Our reply to GROUNDING is the same as before: all the modal bases are covered.

Our reply to CENTRALITY is as before, except that, of one-sidedly inflexible ship-like objects found in every world, we confine our attention to those that could have been **SHIP**s. If we do not pay these modal monsters much notice, that is because they coincide with flat-out real **SHIP**s.

Our account of CONTINGENCY that σ's definitionally essential properties have to stick to it, not through all worlds where it remains a $\mathbb{SHIP}$—a possible **SHIP** — but only through the much smaller range where it remains a **SHIP**. In worlds where σ is only potentially a **SHIP**, its definitionally essential properties (not least **SHIP**-hood) may cease to hold.

Something should be said about the intuitive costs of allowing $\mathbb{SHIP}$-hood not to "call the modal shots" in certain worlds. These costs seems not terribly great. Coincident $\mathbb{SHIP}$s in w differ in their modal profiles owing to differences in their reference-worlds—those where they're not merely $\Diamond$**SHIP**s but **SHIP**s. Also, that something has *got* to be the case sometimes means that it must *actually* be the case, as opposed to counterfactually. It is in this sense that isotropic flexibility has got to obtain; it obtains no matter which world w is actual. The *Santa Maria*, assuming it is the right categorical shape to be a **SHIP**, is in fact a **SHIP** in w, and so has the right sort of well-balanced modal profile there.

SPECULATIVE QUASI-HISTORICAL APPENDIX: KRIPKE, LEWIS, AND LEIBNIZ

Leibniz thought that objects existed in one world only. An Adam-like character who was not followed thousands of years later by Peter denying Christ could hope at most to be a facsimile of our Adam; he would not be the same individual. Leibniz's denial of transworld identity is associated in the popular imagination with Lewis's modal metaphysics rather than Kripke's.[35]

But Kripke may be pushed in a Leibnizian direction himself, if our arguments are correct. Not that **SHIP**s exist in just one world—they are as modally flexible as Kripke thought—or even that $\widehat{\textbf{SHIP}}$s (**SHIP**s-qua-**SHIP**s) exist in just one world. (σ would have existed whether Peter denied Christ or not.) He is pushed in a Leibnizian *direction* to the

[35]The Humphrey Objection was meant to bring out why this is a bad way to go.

extent that $\widehat{\textbf{SHIP}}$s are not as modally flexible as Kripke seems to have taken **SHIP**s to be, and **SHIP**s just are $\widehat{\textbf{SHIP}}$s in his system.

Why do I say this? $\widehat{\textbf{SHIP}}$s are the things that result if we start with a **SHIP** α, then remove it from all worlds where it is a **SHIP** no longer. That is, we jump α up into to an $\widehat{\alpha} = \beta$ that exists just where α is a **SHIP**, and that takes over α' categorical properties where it exists.[36] But, worlds where α ceases to be a **SHIP** do not exist on Kripke's view; if β is a **SHIP** at all, it is a **SHIP** necessarily.[37] $\widehat{\textbf{SHIP}}$s are for Kripke just **SHIP**s, then. But, **SHIP**s are constitutionally flexible to an extent.[38] Whereas $\widehat{\textbf{SHIP}}$s, I've been suggesting, are uniformly constitutionally fragile. (They cannot have been made originally of even a *slightly* different ensemble of planks.) If **SHIP**s are no different from $\widehat{\textbf{SHIP}}$s, as Kripke believes, and $\widehat{\textbf{SHIP}}$s are constitutionally fragile, as argued here, then **SHIP**s too are constitutionally fragile.

Of course, that *we* are pushed in a Leibnizian direction, by our views about $\widehat{\textbf{SHIP}}$s, does not automatically mean that Kripke is pushed in that direction. But we were pushed to it by a UNIFORMITY principle he appears to accept: nothing is of kind **K**, in any world w, unless it has in w the modal properties characteristic of **K**s, like the replaceability of thus and so many planks. To the extent that an actual **K** lacks these modal properties in counterfactual world w, it is not a **K** in w, and the corresponding $\hat{\mathbf{K}}$ (**K**-qua-**K**) does not exist.

[36] Such a β exists by the plenitude principle $\mathcal{P}$.

[37] Going here by what he says about tables: "[I]f the very block of wood from which the table was made had instead been made into a vase, the table never would have existed. So (roughly) *being a table* seems to be an essential property of the table" (Kripke [1980], 114).

[38] This is going, again, by what he says about tables: "If a chip, or molecule, of a given table had been replaced by another one, we would be content to say that we have the same table. But if too many chips were different, we would seem to have a different one" (Kripke [1980], 51).

I can think of only one way of reconciling all these seeming commitments. Go back to the passage about chip-replacement in tables. If we take that passage at face value, then **TABLES** are constitutionally flexible, unlike $\widehat{\textbf{TABLES}}$. But the language Kripke uses—we would be *content* to say that we had the same table—ought to give us pause. "We would be content to say" is suggestive of the Butler/Reid/Chisholm distinction between strict identity and "identity in the loose and popular sense," which involves lumping objects together for convenience which are strictly speaking distinct. Kripke might have his eye, in the "same table" passage, not on the real metaphysical facts of the matter, but a kind of loose talk that we sometimes go in for. I note in support of this that he contrasts macro-identity with "strict" identity in the very next footnote, while seeming to blame modal sorites problems on "vagueness."

> Some sort of 'counterpart' relation ... may have some utility here. One could say that *strict* identity applies only to the particulars (the molecules), and the counterpart relation to the particulars 'composed' of them, the tables. The counterpart relation can then be declared to be vague and intransitive. (ibid, 51, italics mine)

Given the concessions in this passage to vagueness and loose talk, it does not seem wholly out of the question that Kripke in his non-concessive moments wants to identify the *Santa Maria* not with the compositionally flexible σ but the compositionally inflexible $\hat{\sigma} = \sigma$-qua-**SHIP**. This reconciles two ideas to which Kripke seems very much attached:

KIND NECESSITY: Ships are ships necessarily

KIND UNIFORMITY: Kinds fix modal profiles uniformly across modal space.

Both of these hold of $\widehat{\textbf{SHIP}}$s. What we lose is compositional flexibility: Necessarily, none of σ's planks is irreplaceable.

But it is not clear how attached Kripke is to compositional flexibility anyway. The possibility of a **SHIP** that is *loosely* identical to (that is, only a counterpart of) the *Santa Maria*, despite the difference in planks, may be enough for him. Or, if his friendly remarks about compositional flexibility are to be taken seriously *and literally*, he might prefer our earlier plan of sacrificing kind necessity to kind primacy.

So, we have three broadly Kripkean pictures to choose between. One sees the *Santa Maria* as only contingently a ship (**SHIP**). It gets us compositional flexibility and kind uniformity at the cost of kind necessity. Another, differing only terminologically from the first, makes it necessary to the *Santa Maria* to be a ship ($\mathbb{SHIP}$). This second view gets us compositional flexibility and kind necessity at the cost of kind uniformity. The third view, considered only in this APPENDIX, identifies the *Santa Maria* with a $\widehat{\mathbf{SHIP}}$, while taking "ships" (like the first view) to be **SHIP**s. The third view gets us kind necessity and kind uniformity at the expense of compositional flexibility.[39]

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