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**Embodying Artifact Production Knowledge: From Embodied Know-How
to Sensory-Motor Result Representations**

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Introduction

On the amodal view of mental representation, as proposed by Fodor (1975) or Fodor and Pylyshyn (1988), whether the referent of a representation is perceived, motorically interacted with, thought of or imagined, does not bear on the *format* of representation. Representations are symbolic structures and are defined through how those structures combine with other internal representations and their combinatorial properties. According to Fodor, there is a “language of thought” that doesn’t share a common representation format with the perceptual and motorical ways in which we acquire information about the world.

A direct consequence of this view is that the information “conveyed by a mental representation is autonomous from perceptual systems, bodily actions, and their operational details” (Wilson and Foglia 2017). For example, the concept TABLE is autonomous from both our bodily experiences with tables and the physical and functional characteristics of tables. In other words, the same representation is activated when TABLE is, for example, written or spoken about.

To counter this sort of view, psychologists and neuroscientists have argued that the format of representation is modality-specific (e.g., Pecher et al. 2004; Zwaan and Yaxley 2003; Glenberg and Kaschak 2002; Martin and Chao 2001; Solomon and Barsalou 2001; Martin et alia 2000; Spivey et alia 2000). When we think of tables or imagine them, our brains reactivate the same neuronal structures as when we perceive tables or when we bodily interact with them. Put metaphorically, mental representation is *embodied* in the sense that our brain “simulates” modality-specific representations.¹

A direct consequence of embodiment is that sensory and motor processes also play a crucial role in the linguistic representation of such things as tables and cups. Terms such as “table” and “cup” are considered to reactivate sensory and motor patterns of brain activity when written or spoken about.

¹ For a thorough criticism of embodied cognition see Machery (2007).

In the modes of an embodied view of mental representation and word meaning, this paper is concerned with the embodying of *abstract artifact terms*. Publically accessible meanings for such concepts as PIECE OF MUSIC, PAINTING and NOVEL are characterized in French in terms of a productive action term.² A productive action term is a term that refers to a productive action rather than to an action of use. *Le Robert historique* (1992, 1295), for example, characterizes “music” (“musique”) as the art of combining sounds (“art de combiner les sons”). But why is that? Why do we describe an *abstract artifact* as an art of combining sounds?³

One answer is that language reflects that we in fact tend to think of abstract artifacts in terms of the actions that lead to their creations. Another answer is that connections between abstract artifact terms such as “piece of music”, “painting” and “novel” and productive action terms such as “composing” and “writing” are just arbitrary semantic relations encoded in language. In accordance with the amodal view of mental representation we might think that the fact that we speak and think of certain abstract artifacts in terms of *productive action concepts* does not reflect whether and how we perceptually and motorically interact with such things as pieces of music, novels and paintings. Rather, mental representations of such things as pieces of music, novels, and paintings relate to internal symbols whose combination defines the representation format of such concepts as PIECE OF MUSIC, PAINTING and NOVEL.

In this paper, I am going to argue for an embodied view of the relationships between abstract artifact concepts and productive action concepts. On an embodied view of mental representation, I will suggest that the reason why we speak and think about abstract artifacts in terms of productive actions concepts is because sensory-motor representations of the final states of productive actions and the result states of the created result objects play a constitutive role in

² We just need to *google* to see that English dictionaries offer the same meanings for “composition” and “a piece of music”.

³ Abstract artifacts are artifacts that are not defined by their physical realizations. A novel is more than just the sequences of symbols, and a piece of music is more than just a sequence of sounds.

abstract artifact representation.⁴ More generally, I will argue that the representations that play a crucial role in the action of *producing* artifacts also play a crucial role in thinking and speaking of abstract artifacts.⁵

To develop this kind of view, I will clarify the notions of “productive action”, “final state of a productive action”, “result state” and “result object” in section 1. Then, in section 1.1., I will introduce synchronic English data of *deverbal abstract artifact nouns* (nouns deriving from productive action verbs) that are rather compatible with an amodal view of abstract artifact representations and compare it in section 1.2. with Latin data of deverbal abstract artifact nouns that is not only compatible with the amodal view of mental representation but also with the embodied view of mental representation. Then, in section 2, I will outline my embodied view of *immediate result object representations* (that is, of just created artifacts) and I will provide an evolutionary argument for the embodying of abstract artifact concepts in the sections 3 and 4. The basic idea of the argument is that if the perception of immediate result objects during artifact production can be embodied in sensory motor representations, then also abstract artifact representations can be embodied in the very sorts of sensory-motor representations.

The paper will conclude with a prospect of how to plausibly underpin the philosophical view of abstract artifact representations with neuro-scientific methods of testing. Since showing that abstract concepts are embodied has always been a challenge for the embodied views of mental representations (for a recent review see Pecher et al. 2011), neuro-scientifically proving that abstract artifact concepts are embodied would increase the plausibility of the embodied view of mental representation as an overall framework.

1. Preliminary Notions: Productive Actions, Final States of Productive Actions, Result Objects, and Result States

⁴ An understanding of the term “sensory-motor” is provided in section 2.

⁵ This move presupposes that the claim that *action concepts* can be/are embodied in sensory-motor representations is true. For an idea how this is supposed to work, see Gallese and Lakoff (2005).

Before providing linguistic data for the semantic connections between abstract artifact concepts and productive action concepts, let me begin with clarifying the notions of *productive actions*, *result objects*, *result states* and *finale states of productive actions* that build the foundations of my embodied view of abstract artifact representation.⁶ A productive action is an action that results in a new object. For example, the action of composing in the musical domain is a productive action that results in a new object, namely, in a piece of music. Call this new object a *result object*. Furthermore, we tend to think of certain artifacts in terms of *result states*, namely, those object properties that are brought into existence by the productive actions that lead to the result objects in question. To give a simple example of the metaphysical relation between a productive action and its result object, consider a Lego flower. A Lego flower made from composed Lego blocks is a result object of composing. However, the property of being composed of the result object is also a result of the productive action in question, namely, the action that culminates in its *final state* of composing when the action is completed.⁷

To get a better grasp of the issue, contrast the described metaphysical relationship between productive actions and their result objects to how manipulations of *use* relate to their objects. Unlike in the case of productive actions, manipulations of use are not productive in the sense of *creating* an artifact: being grasped is not an essential *artifact property* of a cup.⁸ That is, as such a cup is not a grasped object. A grasped cup is a manipulated cup, but it is not the grasping that makes the cup an artifact.⁹

1.1. Multiple Readings of Deverbal Nouns

⁶ This clarification will be very schematic and it will leave out the question of the *individuation* of a productive action. You can compose a paper by speaking into a recording device, or by typing on your laptop. However, these differences don't affect the idea that there is an overall structure to a productive action, and that overall structure is what I'm concerned with in this section.

⁷ One might disagree that the property of being composed is brought into existence by the productive action if one doesn't believe in creation. That controversy can't be addressed in this paper.

⁸ For a more specific understanding of an artifact property, see Baker (2007).

⁹ One might think: But if grasping is crucial for the function of these objects, then why doesn't it play a crucial role in their creation as well? The answer is that even if grasping might play a crucial role in the creation of certain objects we can still distinguish between grasping as part of creation and sheer grasping as *use*.

In this section, I would like to look at English deverbal nouns that are often used to describe artifacts. Deverbal nouns are nouns that morphologically derive from verbs. To say that a noun morphologically derives from a verb is to say that the verb stem of the verb has been used as a basis of derivation of the noun, and not the noun stem for deriving the verb in question. For example, the noun “composition” derives from the verb “composing”, the noun “painting” derives from the verb “painting”, the noun “writing” from the verb “writing”, etc. Interestingly, most deverbal nouns that describe certain artifacts also describe the productive actions themselves as well as the final states of the productive actions in question and the result states of the objects resulting from the productive actions in question. Let us look at the case of “composition”. For example, when we speak of the following phenomena, we describe by “composition” either the result states of the things in question or the final states of the productive actions in question:

- (1) “The composition *of* Beethoven’s 5th is fascinating”,
- (2) “the composition *of* light and shadow in Van Gogh’s paintings is magical”,
- (3) “Moevenpick – the fine composition” (online Moevenpick advertisement).¹⁰

In (1), “composition” is not used to describe Beethoven’s 5th itself but the result state of composing. In other words, when we say that the composition *of* Beethoven’s 5 is fascinating, we describe a property of the property of composing. Also (2) describes certain properties of the object that result from composing, without “composition” describing the result object itself. When we say that the composition of light and shadow in Van Gogh’s paintings is magical, we say something *about* the painting, and do not necessarily describe the painting itself by “composition”. The same can be said about (3), that is, the phrase “the fine composition” describes something *about* the brand Moevenpick, say, the result state of the thing in question, and doesn’t denote the thing itself.

¹⁰ The source for this is <http://www.moevenpick-finefoods.com/product/die-edle-komposition/?lang=en>.

But one might think that the very fact that one and the same noun can describe different metaphysical categories shows that the relationship between a concept and its format of representation can't be modality specific. The way we talk and think about artifacts does not reflect what artifacts are and how they have been made. In other words, one might think that the data just is a confirmation of the *amodal* view of mental representation.

1.1 Latin Result State Terms as Means of Conceptualizing Certain Abstract Artifacts

In order to counter the view that the linguistic data above doesn't suggest that sensory and motor engagements with artifacts play a role in abstract artifact representation, let us look at how *Latin perfect (passives) participles*, in short *Latin P(P)Ps*, are used to conceptualize artifacts. Latin P(P)Ps either directly serve to conceptualize artifacts or are used to derive specific nouns for describing artifacts. Here are then some examples that demonstrate how artifacts are conceptualized in Latin:

- (4) “notae” (note), *nominalized PP* in the feminine form of “noscere” (noting),
- (5) “manuscript” (manuscript) from “manu”, ablative form of “manus” (hand), and “scriptus” (written), *PP* of “scribere” (action of writing),
- (6) “scriptura” (writing) comes from “scriptum” (written), *nominalized PPP* of “scribere” (action of writing).

Such morphological derivations in Latin seem to be particularly interesting because P(P)Ps form the grammatical category of *executed actions*, such as *having noted*, *having written*, and *having sculptured*.¹¹ This data is interesting because it is true that a piece of music *is* composed, and that a novel *is* written. However, if the amodal view of mental representation is true, it should be an arbitrary fact that it is the feature of a result state of a result object that serves for conceptualizing abstract artifacts. Call this *the Arbitrariness Thesis*.

¹¹ Interestingly, also (7) the English noun “artifact” is derived from “factum” (made) plus ablative form of “ars” (art or skill).

Arbitrariness Thesis: There is no deep reason why language encodes some of the abstract artifacts in terms of characteristics features of their making processes.

Contra this thesis, I will argue that language sometimes encodes certain abstract artifacts in terms of productive action terms because we in fact represent abstract artifacts in terms of the sensory-motor processes that lead to their creations.¹² There is, for example, sufficient evidence that the PPP “scriptum” (or “scripta” in plural and nominalized) has been introduced for the artifact itself, although, as (6) illustrates, there is also the *noun* “scriptura” for denoting the artifact itself. Here is a paradigm example for “scripta”:

(8) “Verba volant, scripta manent” (spoken words fly away, written words remain).

Here, “scripta”, the plural form of “scriptum”, is used to describe the written *words*, that is, the result object of the action of writing although there was also “scriptura” for the artifact itself.

Why is that? Why is the PPP preferred to the *actual* noun? One might think: If it did not play any role for conceptualization whether words happen to be written or not, then “scriptura” would have served the same purpose -- especially because “scriptura” has multiple meanings and doesn’t only denote the result object of writing, but also the action of writing.

However, note that we do not need to focus on (8) to make the point. One might object that (8) is not a good example of a conceptualization of an artifact in terms of a PPP, since, in (8), “scripta” marks the difference between written and spoken than describe words themselves. To undermine this objection, let me provide a different paradigm case for “scripta” describing an *artifact*:

(9) “Latina scripta” (Latin scripts)

¹² One might object, as Louise Antony has done, that it’s not clear what it means to say that abstract artifacts are represented in terms of *the* sensory-motor processes that lead to their creations, since you could compose a novel by speaking into a recorder, by moving a pen across paper, or by typing on a keyboard – which are all motor routines but still different processes. While this might be true, the point is that I *deny* that they are different processes. On the face of it, it seems that it couldn’t be denied that these different processes have one thing in common: they are all *sensory-motor* processes.

Here, “scripta” surely does not highlight the written as opposed to the spoken but rather denotes the result object itself.¹³ And it’s an interesting question why.

2. An Embodied View of Mental Representation

Analogous to the linguistic data that we looked at in section 1.2.,¹⁴ I would like to first propose an embodied view of the mental processing and representation of *immediate result objects* and then discuss a potential objection to the application of the view to *abstract artifacts concepts*, i.e., the concepts that we looked at in section 1.1. If we can make the case for immediate result objects to be represented in terms of sensory-motor representations, then we might explain why language makes use of action result state terms in order to describe abstract artifacts. The basic idea behind the antecedent of this conditional claim is threefold. Call the idea in question the *Result Representation View*.

The Result Representation View:

- (i.) When we productively engage with material objects, our representations of our engagements are *sensory-motor* representations.
- (ii.) These sensory-motor representations are not only representations of our productive actions but also representations of the *result states* of result objects.
- (iii.) Sensory-motor representations of the result states of result objects are also integrated with the sensory-motor representations of *final states* of productive actions.

To begin with (i.), we need first of all to understand what “sensory-motor” means. To do so, let’s look at a quote from Bompas et al. (2002, 90) that describes the hypothesis of the sensory-motor *contingency* theory¹⁵:

¹³ Some of the data presented in this section is available at <http://www.zeno.org/Georges-1913>.

¹⁴ Note that the linguistic data presented so far is at most evidence for the view that *some* abstract artifact nouns are represented in the way I am going to suggest. There are numerous counter-examples to the idea that abstract artifact terms derive from productive action terms. For example, the English verb “texting” has been derived from the noun “text”. Thus, *prima facie*, it would be wrong to claim that the linguistic data that I have presented suggests that *all* abstract artifact nouns are represented in the way that I am going to suggest. Rather, if I am right, then representing an abstract artifact in terms of a sensory-motor representation might at most be *one* way of representing an abstract artifact.

¹⁵ To get a complete view of the technical notion of a sensory-motor contingency and further references, see O’Regan and Noë (2001).

The sensorimotor contingency theory hypothesises that our experience of a rich, colourful, environment derives not simply from the information originating from sensory input channels, but also from the laws that these signals obey when the observer or the stimulus move.

Analogously, I claim that when we act on manipulable objects such as Lego blocks to create new objects, there are no distinct motor representations of our actions and distinct representations of our perceptions of the things in question, but we have representations that couple action and perception.

Then, as to (ii.), the idea is that representing the *result state* of a newly created item must be part of representing a newly created item. Based on the idea that sensory and motor representations are integrated, I call the sensory and motor representations of the result states of newly created items “sensory-motor result representations”.

Furthermore, the representations of final states of productive actions must be integrated, if they are not even identical with, the sensory-motor representations of the result states of the created objects. That is, there must be a specific moment of recognition of the sort “I have done this amazing work”, or “I have created a new item” when we complete a productive action.

2.1. Why Posit *Result* Representations?

To see why we need to posit result representations as being the format in which at least immediate result objects are sensory-motorically represented, consider the following principle. Call it *the Underlying Principle*.

Underlying Principle: If sensory-motor result representations play a crucial role in the representation of *composable objects*, then they also play a crucial role in the representation of the immediate *result objects*.

To begin with the antecedent claim, let me introduce Gibsonian (1979) affordances and then apply the notion to the case of *productive actions*.¹⁶ Affordances are action possibilities

¹⁶ For a critical view of the notion of affordance see, for example, Siegel (2014).

correlating with physical structures. According to the *Ecological Approach to Visual Perception*, “meanings” of things in the environment can be “directly perceived” and they invite to acting in certain ways. For example, the action possibility of sit-on-able plays a crucial role in the perception of a chair and the action possibility of drink-from-able plays a crucial role in the perception of a cup. However, we can also distinguish between action possibilities for individuals depending on the individual’s physical traits. While a toddler might be able to crawl under a bed, an adult might not. Thus, while a toddler might perceive that she can crawl under a bed, an adult might perceive that she can’t crawl under a bed.

Now, to apply affordances to the case of productive actions, consider the following comparison between use and production. To begin with use, suppose that the following is true about use: given the composition and layout of a chair, an adult can directly perceive that she can sit on the chair. Now, what would an adult directly perceive in the case of production?

Intuitively, the following seems plausible: the things that we directly perceive in the context of production are *loose* individual items such as Lego blocks.¹⁷ In other words, it seems that Lego blocks are the kinds of things that can serve the production of new items.¹⁸ Lego blocks can be processed in terms of the action possibility of composable, and if so then we must probably know what composed Lego blocks look like in order to compose, say, a Lego flower.

Now, the question is where do we get this knowledge? As I see it, it is the recalling of representations as discussed in (i.-iii.) that play a role in knowing what composed Lego blocks look like.¹⁹ Likewise, if I process musical items or words and phrases in terms of the action possibility of composable, then I probably must also know *how* to compose musical items, words and phrases, i.e., I must represent not only the action of composing itself and culmination of

¹⁷ Or, in order to already provide examples for *abstract* artifacts: musical tones, or phrases and words are loose items that we can put together and thus should also process in terms of composable.

¹⁸ As I see it, things like chairs and cups are unlikely to be processed in terms of composable. But one might disagree here depending on one’s deep metaphysical views and commitments. I can’t address the issue here.

¹⁹ Now, there is still the important question whether one needs to have an intuitive idea or concept for producing the artifact or whether one can just experiment. I will address this important matter in section 3.

composing but also the result states of the potential *result objects*. If this is the case, then Underlying Principle is true.

2.2. Sensory-Motor Result Representations of Abstract Artifact Concepts

Note that my example for productive actions possibilities in section 2.1. was mainly the making of a Lego flower out of Lego blocks, and not the making of an *abstract* artifact such as a novel or a musical work. Therefore, I need to address the following question. Call it the *Expert Question*.

Expert Question: What about the expert aspect of such productive actions as writing a novel or writing/composing a piece of music?

One might think that a great part of creating abstract artifacts goes beyond sensory and motor capacities. That is, someone who composes a musical piece is normally a music expert whose know-how goes beyond putting together perceptual entities such as musical tones and rhythms. Likewise, one might think that someone who writes a novel is normally a literary expert whose know-how to write a novel goes beyond the motorical writing of a piece of text on paper, etc. Call this non-sensory-motor part of know-how “amodal know-how”.²⁰

To react to this sort of criticism, I simply suggest *decoupling* productive action concepts from expert knowledge. That is, I suggest that we think of composing in the musical domain in the way we think of composing a Lego flower from Lego blocks. Although non-experts might not be able to create pieces of music, non-experts might be able to gain conceptual access to abstract composing processes in virtue of their basic composition knowledge. In order to make this idea sensible, that is, that it might be principally possible to mentally access more complex kinds of composing processes in terms of the more basic kinds, I will first say more on amodal know-how and then provide an evolutionary argument for the *embodying* of amodal know-how.

²⁰ Note that the same sort of thing also holds for the non-expert: *Anyone* who writes a novel doesn't just put words and sentences together. *Anyone* who composes a piece of music does more than putting musical tones and rhythm together.

3. An Evolutionary Argument for Embodied Know-How

3.1. Amodal Know-How

What exactly is amodal know-how? In analytic metaphysics (e.g., Thomasson 2007, Hilpinen 2011), it is assumed that the result object of a productive action is not simply the outcome of a productive action culminating in its final state, but that it is also the result of a corresponding productive *intention* of the author to make an object of a certain kind. According to Hilpinen's (2011, italics added) Dependence Condition,

the existence and some of the properties of an artifact depend on an author's *intention* to make an object of a certain kind.

And since an intention is neither perceptual nor motoric, amodal representations must play a crucial role in producing artifact. Here is a further statement by Hilpinen (*ibid.*, italics added) that confirms the view that artifact production crucially depends on amodal representations:

An author's productive intention is often expressed by *cognitive artifacts* which show the character of the intended artifact and the way it should be constructed, for example, a drawing, a diagram, or a model of the artifact, together with a list of parts and materials and a set of instructions (a precept) for the production process. Such representations are especially important in the case of collectively produced complex artifacts.

While the notion of a collectively produced artifact is an interesting one, let us concentrate on the notion of a cognitive artifact. The labeling of such things as a list of parts and materials, a set of instructions as well as models, diagrams and drawings as "cognitive artifacts" sounds as if artifact representations are amodal representations, that is, representations that are not properly embedded in the environment in which productive intentions are executed.

Supposing that this is the view, I submit that there is a problem for it: Even if we suppose that it is true that making artifacts also involves an *intention* to make it, it is still an interesting question where productive intentions and artifact concepts come from. And, as I see it, the proponent of amodal know-how can't adequately answer that question. That is, the defender of amodal know-how cannot suppose that we have developed artifact concepts and according

productive intentions in virtue of sensory-motor interactions with worldly items. Rather, she has to presuppose the *having* of corresponding intentions and concepts in order to explain where the very productive intentions and concepts come from. And, this is not only circular, but also counter-intuitive.

According to what I call the *Intuition from First Creation*, we don't need the concepts for making the artifact. And if we don't need the concepts for making the artifact, then it is justified for us to believe that artifact production knowledge is embodied. However, before getting to this last step, let me first describe the intuition from first creation.

3.2. The Intuition from First Creation

How were we able to produce artifacts before we possessed corresponding intentions and concepts? Put differently, how were our *ancestors* able to create artifacts? When our ancestors made the very first objects they presumably did not have intentions to create them. According to me, both first artifact concepts and productive intentions come from discovery and observation, and that speaks for the embodied view of abstract artifact representations. However, this move isn't available to the defender of amodal know-how.

To support the intuition from the first creation, let me provide an example of a productive activity from anthropological theory that I take to not require concepts and intentions, but whose result objects I would call an "artifact". In his book *An Anthropological Analysis of Food-Getting Technology* (1976), Oswalt argues that artifacts can be characterized in terms of the actions that lead to their creations, and those actions in turn can be reduced to a small number of basic ones, such as *separation* and *conjunction*. For example, the making of a walking stick by breaking a limb from a tree and stripping it out of leaves and barks can be understood in terms of the productive action of separating one object from another, and doesn't require positing any specific action types such as breaking and stripping in order to explain the artifact production.

More importantly, we can provide an evolutionary account of artifacts by appealing to a limited set of productive activities.

Now, what is at issue for our purposes is that the execution of the actions that Oswalt characterizes doesn't seem to necessitate any concepts or/and intentions.²¹ In particular, it is plausible to suppose that the very first walking stick made from the limb of a tree was the result of *spontaneous* interaction with worldly items and the result of observing how a productive action culminates in the result state of a result object. By spontaneously reaching for a tree limb and grasping it, an ancestor might have been able to put force on the limb and break it. However, having observed that result, an ancestor might then have been able to repeat the mindless action, that is, "separate" the leaves from the limb by stripping it. As I see it, this is a way to characterize the basic action of separation to which a number of productive actions reduce to without having to posit any specific productive action concepts or any specific productive intentions. Before describing how one could build on this view to explain the representation of *abstract artifact concepts*, let me also explain how the defender of amodal know-how might want to explain first creations, and why her explanation doesn't work.

3.3. Considering A Reply by the Proponent of Amodal Know-How

How could the defender of amodal know-how explain first creations? Maybe, she could explain first creations by appealing to *innate concepts*. According to Fodor (1975, 1981), concepts such as CAR and DOG are not acquired experientially. When children are presented with certain items they only acquire the words for the items in questions, and not the concepts. This is so because children are already born with the concepts. They don't learn them through experience.²²

²¹ One might object that if the ancestor doesn't *intend* to use the stick as an aid to walking, it isn't a *walking stick*. But this seems to be a terminological point. If the ancestor creates one and starts using it for walking, then it simply *is* a walking stick.

²² Note: Fodor revises his view of concepts in *The Elm and the Expert* (1994) where he assumes that concepts can be acquired (by a process he calls "triggering"), which is not the same as learning, but which doesn't entail that all concepts are innate. Thanks to Louise Antony for pointing this out.

Many philosophers have argued that it is very implausible that such concepts as CAR and DOG are innate. Hilary Putnam (1988, 15), for example, has claimed that Fodor's theory is incompatible with the theory of evolution. Putnam says:

To have given us an innate stock of notions which includes carburetor, bureaucrat, quantum potential, etc., as required by Fodor's version of the Innateness Hypothesis, evolution would have had to be able to anticipate all the contingencies of future physical and cultural environments. Obviously it didn't and couldn't do this.

I agree with this verdict, that is, that it is unlikely that the mentioned concepts are innate. Analogously, I have pointed out in the previous section that it is rather plausible that our very first productive action concepts were gained from worldly interactions and that more complex kinds of concepts are linked to more basic kinds of concepts. But the defender of amodal know-how might reply that if our ancestors didn't have the corresponding artifact concepts when making the artifacts, then she doesn't think that the things our ancestors were able to produce were in fact artifacts. However, the problem with such a reply is it doesn't enable us to explain where productive intentions and corresponding concepts come from. Just *because* the amodal know-how view suggests that artifacts are creations dependent on humans intending to make them, we want to know how we come to intend to make artifacts. The advantage of supposing that the very first things that were created are "artifacts" is that we can actually provide a satisfying answer to the question where artifact concepts and productive intentions come from.

4. From Embodied Know-How to Sensory-Motor Result Representations

Based on what we said in section 3.3, my argument for the embodying of artifact production knowledge can be formulated as follows. Call it the *Embodying Argument*.

Embodying Argument: If we suppose that our very first productive interactions with material objects were shaped by *discovery* and *observation experiences* (whether or not these interactions can count as "artifact" production), then we can explain where both productive action concepts and productive intentions come from.

In *modus ponens* form the Embodying Argument goes as follows:

- I. First creations are results of discovery and observation experiences.
- II. If first creations are results of discovery and observation experiences, then artifact production knowledge is embodied in sensory-motor result representations.
- III. Therefore, artifact production knowledge is embodied in sensory-motor result representations.

Based on prior discussion of both the threefold idea of a sensory-motor result representation in section 2 and our discussion of the previous section, the core premise to be defended in my evolutionary argument for embodied know-how is premise II. This seems necessary since one might think that even if we suppose that it is true that first creations are the results of discovery and observation experiences, it does *not* follow that artifact production knowledge is embodied in sensory-motor result representations.

Here is a response to that: If we think of sensory-motor representations as a source of *gestalt principles*, then it *is* plausible to assume that during and right after a first creation there must have been a visual recording of the culmination of a productive action in its final state and thus in the result state of the created object – providing a basis for the tradition of artifact production knowledge.²³ Werning (2012), for example, has argued that although object representations are decomposable into meaningful features such as color, orientation, shape, we neuronally represent *whole objects*. Maybe, we could make an analogous argument for the case of abstract artifact representations. If we were to discover that sensory-motor result representations provide the basis for explaining gestalt principles in the case of abstract result objects representations, we would have some reason to believe in the adaptational anchoring of abstract artifact concepts in sensory-motor result representations.²⁴

²³ Note that this isn't supposed to make any assumptions about how individuals acquire productive intentions. Rather, it is supposed to provide a picture of the acquisition of productive intentions by the human species as a whole.

²⁴ A drawback of my embodied cognition view is that it doesn't address the question how blind people can compose, paralyzed people can compose, and deaf people can compose. As we know, these are the sorts of challenges that any embodied view of mental representation struggles with. Thanks to Louise Antony for pointing this out.

5. Concluding Remarks

To sum up, I have argued for an embodied view of abstract artifact representation from a non-scientific point of view. On my philosophical view, we have evolutionary reasons to believe that abstract artifact representations are embodied in sensory-motor result representations. The merits of the view are threefold: we can explain close connections between Latin PPPs and artifact terms, we are able to link basic kinds of productive action concepts to their “abstract” kinds, and we can accommodate the intuition from first creations. Whether it is neuro-scientifically confirmable that we represent pieces of music and other sorts of abstract artifacts in terms of sensory-motor result representations (that are available to non-experts) and whether we do so every time we think about musical compositions and other sorts of abstract artifacts is a topic I leave to neuroscientists.²⁵

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