

Composite Agency and Artifact Abilities

Dawei Wu

Institute of Philosophy, Free University of Berlin, Germany

ABSTRACT

Since we have witnessed the rampant development of technology in recent years and worries concerning the independence of artifacts and potential antagonism between artifacts and human beings are proliferated, a philosophical investigation into the nature of artifacts is especially pressing. This essay invokes the resources from the contemporary philosophy of dispositions and abilities to provide a novel perspective of the metaphysical nature of artifact function (and hence artifacts abilities) with a special focus on the role of human beings in relation to artifacts via the process of their ability-manifestation. By introducing and discussing some interconnected issues in contemporary debates including semantic analysis, intrinsic/extrinsic distinction, and causal basis, this essay is anticipated to establish a sophisticated account of artifacts abilities, which suggests that artifacts abilities must be understood as the composite agency with human beings are an essential constituent.

KEYWORDS

Disposition; Abilities; Artifact

We live in a world full of artifacts. One point that stirs philosophical interest in artifacts is the nature of artifact function since our modern life is deeply entangled with artifacts equipped with various functions: a smartphone can record videos; a navigation application can find you the right way; an airplane can fly and carry hundreds of people across the globe. Although these functions are impressive and complicated so that they sometimes go beyond the intellectual grasp of ordinary people, we should not forget the fact that all artifacts are designed, manufactured, and supposed to work only in situations where human operators are available, therefore they are still in some sense dependent on human beings. It is this feature of artifacts that renders the place of artifacts in human society (or put it in another way, the place of human beings in a world of artifacts) an arresting topic of philosophical concern.

Facing this issue, philosophical debates on artifact function are mainly the endeavor to account for the embeddedness of artifacts in human society and lay the major part of attention on the history of how artifacts are produced and reproduced (Preston 2020). Inspired by Searle (1995), many hold the view that artifact functions are dependent on and derivative of a collective human intention since their reproduction will not be maintained without the collective human intention. Philosophers on the other side resist the intentionalist picture of artifact functions and emphasize the fact that the collective human intention of artifact production and reproduction has its base in artifact function, which seduce, channel, and reinforce the unfolding of the material and productive culture of human society in a certain direction (Preston 2013). Between these two extremes, there is

also a middle ground for scholars to develop theories that interpret the interplay between human beings and artifacts into different brands, including Millikan (1984) and Houkes & Vermaas (2011).

In this essay, however, I plan to explore the metaphysical nature of artifacts by redirecting the focus point from the historicity of artifact function to the way they are realized and instantiated. It can be generally accepted that the artifact function is a kind of power with dispositional characteristics and that we ascribe abilities to artifacts when using “can” to connect artifacts and their functions. Throughout this essay, I will translate artifact function to artifact abilities as dispositional properties to benefit our understanding of artifacts by permitting insights from the philosophy of dispositions and abilities. Among various artifacts, I pick out airplanes and their abilities to fly as a paradigmatic example to represent a wide range of artifact abilities, and every conclusion I draw can be applied to artifacts akin. For the sake of the argument, this example is simplified such that only two factors are considered relevant, namely the operation of human pilots¹ and the mechanical structure of airplanes². This example will deviate from the real-world airplanes in the sense that I omit many causally efficacious factors which can render my conclusion less reliable, I will pay attention to and elaborate on this point in due course (Sect. 4.2).

In section 1, I will show how the subject matter fits in the existing literature in the philosophy of dispositions and abilities and demonstrate its philosophical importance by raising a question that yearns for an appropriate metaphysical account. In section 2, I briefly introduce a state-of-the-art semantic analysis of human abilities, which yields profound insight from the modal perspective and will be of auxiliary use in the current project. In section 3, I will first introduce two candidate accounts and clarify some crucial concepts, then I will put forth an alternative construal by highlighting another dimension of artifact abilities. In section 4, I will argue that the third account is the most ideal option and reply to some potential worries about my project.

1 Setting the Stage

To demonstrate the philosophical interest concerning the metaphysics of artifact abilities in question, let us start by considering the following scenario:

The Post-Apocalyptic Airplane (TPA): There is a possible world where human beings are extinct for some reasons and no other species that is intellectually and physically competent for piloting has emerged, and there is an airplane, with its mechanical structure intact, equipped with all mechanical makeups that are required for flying. Given that human beings and all potential pilots are absent, any manifestation of the airplane’s ability to fly will certainly be frustrated, but the question is: Does the airplane in the scenario still retains its ability to fly? That is to ask, whether its ability is masked or removed given that the manifestation is a destined frustration.

The tricky point of this example is that one has intuitions to argue for and against the preservation of the ability in this case simultaneously. On the one hand, one can claim that the airplane’s ability is just masked in the sense that it does not have the opportunity to exhibit its ability and therefore it retains its ability; on the other hand, others can retort that human pilots are essential to the airplane’s ability for whenever an airplane exhibit its ability, there must be pilots interacting with the airplane, therefore its ability is removed given the absence of human pilots.

1 There are some notions closely related to this factor. The operation of human pilots can be understood as the interaction between human pilots, which takes the presence of human pilots as a prerequisite. In this essay, I will use these terms interchangeably, and it will do no harm to the current project.

2 I will use “the airplane” as an abbreviation of this factor. This factor is understood in isolation not only of human pilots, but also of more subtle connection with its designers, maintenance personnel, and administrators.

Note that there can be two senses of abilities which are determined by the conditions that we take as the relevant successful manifestations of abilities. For example, if merely “getting off the ground” suffices to exhibit the airplane’s ability to fly, then this ability in question is understood in a weak sense. On the contrary, the ability understood in a strong sense will impose more constrain on the qualification of abilities. One (but not the only) way to establish such a strong sense appeals to the idea that the bearers of these abilities should have control over their manifestation, this idea will be discussed later (Section 4.1). In this essay, I mainly focus on the weak sense of abilities which is hence taken as the default meaning, and it will be explicated when I turn to discuss abilities in a strong sense.

Now, to answer the questions from TPA, several facets are so deeply entangled that any answer to this question must bring about an account that covers all these facets. The first facet is whether the airplane’s ability to fly is understood as an intrinsic or extrinsic ability. If this ability is intrinsic, then the possession of this ability is independent of extrinsic factors, which are all kinds of interference from the external environment. The second facet concerns the place of human beings since the intrinsic account of the ability tends to regard the presence of human pilots as non-essential, and *vice versa*. In the third facet, if the manifestation of the airplane’s ability is frustrated by extrinsic factors, then this ability is masked not removed. A likewise inference can be made from the perspective of the extrinsic account of the ability, which will lead to the conclusion that this ability is removed not masked.

The questions from TPA have complicated implications as they are entangled with many metaphysical features of the airplane’s ability. But before I dive into the metaphysical investigations, I first examine a cutting-edge analysis from the semantic angle.

2 A Semantic Analysis

One may suggest that the TPA question can be easily dismissed after a semantic analysis if the TPA question is asking whether one can still claim that the airplane “can” fly in the scenario so constructed. Lewis (1978) argues that the word “can” used in ordinary English is context-sensitive. Confronting the same scenario, it is very likely that one can ascribe “can” and “cannot” to an agent to perform a certain action simultaneously if there are some factors that are compossible with the agent’s performance and some other factors that are impossible with her performance. Different factors are considered relevant in different contexts, thus “can” and “cannot” can be ascribed to an identical scenario. This line of thought can be applied to TPA perfectly as there is a factor compossible with the airplane’s ability to fly, namely the well-functioning mechanical structure, as well as a factor impossible, namely the absence of human pilots. The *prima facie* dilemma is due to the different contexts we are in when ascribing the ability.

There is also a positive account for the ascription of artifact abilities. After examining both the agentive and non-agentive abilities, Jaster (2020:Sect. 5.3) proposed a success-oriented semantic analysis for abilities in general.³ According to her success view, “an agent [or artifact] has an ability *tout court* to ϕ if and only if $S\phi$ ’s in a sufficient proportion of the relevant possible situations in which some S -trigger for ϕ -ing is present. (Jaster 2020:160)” In the airplane case, the S -trigger will be, I suppose, the appropriate interaction between the pilots performing according to certain

³ Jaster does not provide analysis for artifact abilities explicitly. However, her exposition in the chapter concerning the non-agentive abilities with various triggering conditions instead of intentions as antecedents can easily extrapolate to the analysis of artifact abilities since they all fit in a general pattern with three crucial constituents: stimulus condition, characteristic manifestation, and a modal connection in terms of a sufficient success rate.

procedures and the operating system of the airplane. Thus, an airplane has the ability to fly iff it flies in a sufficient proportion of the relevant possible situations in which the correct interaction is present.

The situation in TPA resembles the impeded intention problem in the discussion of human agentive abilities, where the agent is for some reason under constant ability frustration because she cannot generate the qualified intention to perform the corresponding intentional action. In this case, the agent's abilities will be diagnosed as removed and Jaster's analysis provides a successful prediction. The airplane case complies with the same argument, since S-trigger is the interaction between the airplane and human pilots, which serves as the antecedent of the semantic analysis and also entails the presence of human pilots, then the airplane's ability to fly is rather removed not masked in the absence of human pilots. A range of implications also follows from the semantic analysis: If this ability is removed in absence of human pilots, it also suggests that human beings play an essential role in the airplane's ability, and that this ability is an extrinsic ability with the operation implemented by human pilots as a necessary causal basis.

However, the aim of this essay is not to defend an extrinsic account of artifact abilities, but to defend a revised and more sophisticated version of the intrinsic account that is compatible with the prediction produced by the fruitful semantic analysis we already had. If such a revision is possible, it entails that the seemingly tight concatenation between the diagnosis as removed ability in the TPA case and its extrinsic status can be rejected. But how? If we take the airplane's ability as intrinsic, it seems inevitable to render the absence of human pilots as a non-essential external factor that only masks the ability. My answer will be, in short, by constructing the ability-bearer as a composition that includes human pilots and the airplane as its proper parts.

3 Three Accounts of Artifact Abilities

Many philosophers endorse the idea that dispositions as well as abilities, if understood in a broad dispositionalist sense,⁴ have two important features that are intuitively widely recognized, namely the theses that dispositions are intrinsic properties and that dispositions have causal bases.⁵

These two theses are closely related because one rationale beneath the intrinsic claim of dispositions is that all causal bases are intrinsic to the disposition bearer (Lewis 1997). In contrast, one way to construct the possibility of extrinsic dispositions is to argue that there are some causal bases that are both essentially causally efficacious and extrinsic to the disposition bearer. This requires clear characterizations of the concept of intrinsicity and causal bases respectively, which will be presented along the way as I introduce different accounts of artifact abilities.

3.1 The Intrinsic Account and Intrinsicity

The gist of the intrinsic account is that the airplane's ability to fly is an intrinsic property of the airplane. But it remains to be clarified in what sense this ability can be regarded as intrinsic.

There are different intuitions about the distinction between intrinsic and extrinsic properties, we may think that intrinsic properties are possessed in virtue of the way that thing itself is, or that

4 Some philosophers reject the idea that abilities can be understood as dispositions because there are some features of abilities that cannot be captured by the dispositionalist account (Vetter 2016, Vetter & Jaster 2017). Despite the skepticism against the dispositionalist account, a large part of the discussion about disposition can shed light on abilities due to their obvious similarity. Thus I will set this controversial point aside.

5 It is controversial whether all dispositions have causal bases. Some philosophers argue for the possibility of bare dispositions, which are dispositions without any causal basis. Cf. McKittrick, 2003b; Mumford, 2006.

intrinsic properties are those necessarily possessed by something and its perfect duplicates, whereas extrinsic properties can differ in response to the different external surroundings. However, those explanations are somewhat circular because, for example, the concept of duplicates is also defined in terms of intrinsic property such that x' is a perfect duplicate of x , iff x and x' have exactly the same intrinsic properties (Lewis 1982: 197). To develop this coarse-grained intuition into a sophisticated philosophical account, Lewis (1998) put forth a formal definition of intrinsicity by appealing to the concept of loneliness and accompaniment: a property is intrinsic to some object x iff "having or lacking the property is independent of accompaniment or loneliness [with any contingent object that is wholly distinct from x]. (p.334)"⁶

Intrinsicity so defined can also be interpreted in terms of relationality because the independence of accompaniment or loneliness describes a relational status that it is not the case that the bearer of the property is related to another contingent and distinct object in virtue of having or lacking this property. Therefore, intrinsic properties are not relational properties with one of its *relata* as some distinct object. Following this line of thought, Francescotti (1999) names such relations as d-relations and develops his definition of intrinsicity such that " F is an intrinsic property of item x [means that] x has F , and F is not a d-relational property of x . (p.602)"⁷

Now, we have a more scholarly rigid qualification of the meaning of being intrinsic and extrinsic when we ascribe such a status to artifact abilities. To say that the ability of some artifact is intrinsic means that this ability, viewed as a property, is not a relational property with, at least, one of its *relata* as a distinct and contingent object. In another word, whether this ability obtains is independent of whether it is accompanied by some distinct and contingent object or alone. (And the extrinsic abilities simply take the negation of this qualification.) Therefore, the intrinsicity of the airplane's ability suggests two theses (a) that the human pilots are distinct and contingent objects for the airplane because, to use Francescotti's definition, the interaction between human pilots and the airplane is a d-relational property of the airplane, which further leads to (b) that what is causally essential for the manifestation of flying must be intrinsic properties of the airplane. As a joint consequence, the intrinsic account ascribes the airplane's ability to the physical makeup of the airplane, that is the mereological whole of all mechanical components, where human pilots can be absent in its perfect duplicates and regard human pilots only as a non-essential factor even though they can influence the success or failure of the abilities' manifestations. Therefore, the intrinsic account will diagnose the ability frustration in TPA as masked rather than removed.

However, Jaster's semantic analysis has already shown that the ability frustration in TPA is removed instead of masked. As a result, a theoretically robust account of artifact abilities, which should evade the violation of and the mismatch with the semantic analysis, will have to disagree with the intrinsic account on, at least, one of its central thesis.⁸ As we will see in the next two subsections, the extrinsic account disagrees on b), for b) can be rejected even when a) is accepted, whereas my refined intrinsic account will reject a) straightforwardly.

6 More precisely speaking, this definition is for what Lewis calls "basic intrinsic properties" because there are further considerations for more complicated cases involving disjunctive, or maybe unnatural properties (cf. Hawthorne 2001). However, I suppose the subject matter of this essay, artifact abilities, are natural and non-disjunctive properties, thus Lewis's definition of basic intrinsic properties will suffice.

7 This is again a simpler version of the definition than what Francescotti actually offered. However, the concept of d-relation is the foundation of his official definition and this simpler version will suffice for my current project. For more details, cf. Francescotti 1999, 2014.

8 Proponents of the intrinsic account may simply reject Jaster's analysis, but they have to provide reasons to show why Jaster is wrong. It is certainly a merit of non-intrinsic accounts to align with the semantic analysis, but they are established also for reasons independent of semantic considerations (Sect. 3.2).

3.2 The Extrinsic Account and Causal Bases

Dispositions are typically considered as intrinsic properties because, intuitively, perfect duplicates have exactly the same dispositions. McKittrick (2003a) provides a classical example of extrinsic dispositions, which suggests that perfect duplicates can be disposed differently. The example that is often used to illustrate is a key's disposition to open a lock only when the lock mechanism corresponds to the key's shape. I have a key that can open the front door of my apartment, but this disposition hinges on the condition of the lock mechanism on the front door. Since the lock is a distinct and contingent object from the key and the matching of the lock mechanism stands in a relation to the key's shape, then the key's disposition to open the front door is extrinsic. The case of the airplane's ability is similar because whether it can fly depends on whether there are pilots driving it. Therefore, its ability can be said to be dependent on the conditions of the external world. Then, we have the extrinsic account of the airplane's ability, which also ascribes the ability to the physical makeup of the airplane but as an extrinsic property and predicts the ability-frustration in the TPA case correctly as removed.

The divergence between the intrinsic account and the extrinsic account lies in the different evaluations of the role that human pilots play in the manifestation of the airplane's ability. It is mundane to say that human pilots are necessary for the airplane's ability and its manifestation and that this ability is hence dependent on the presence of human pilots because the necessity and dependence are amenable to different interpretations. In favor of the intrinsic account, one can argue that the presence of human pilots is merely an opportunity for the ability manifestation because what is really at stake is the intrinsic properties of the airplane, and the lack of opportunities shall not undermine the very existence of abilities. Advocates of the extrinsic account may clamor that there is a stronger connection between human pilots and the airplane's ability so that the presence of human pilots is esteemed essential. It requires the extrinsic account to provide a more substantial clarification regarding the exact type of dependence of the airplane's ability on human pilots.

I locate this issue in the contemporary debates about causal bases of dispositions, and thus I assume that the extrinsic account will interpret the dependence in question as causal dependence such that the presence of human pilots is causally necessary for the manifestation of the airplane's ability. This idea is largely motivated by the seminal work of David Lewis (1997) where he promotes an account of dispositions that is designed to settle the problem of finkish dispositions. A disposition can be finkish when acquiring or losing this disposition can be caused by the stimulus condition of the supposed manifestation. Lewis envisages a fragile glass overwatched by a sorcerer who will change the glass's molecular structure when it gets struck so that it will not break (p. 148). The simple conditional analysis fails when confronting this counterexample and Lewis attempts to remedy the conditional analysis by appealing to the causal bases. According to his reformed analysis, something is disposed to respond to stimulus iff some (cluster of) intrinsic properties and the stimulus condition would jointly be a complete cause for the manifestation of the disposition (p. 157). In this construal, the stimulus conditions and some relevant properties will be causal bases of dispositions.⁹ And the causal bases are certainly essential to the airplane's ability in the sense that their causal efficacy guarantees them to be an inevitable part in the definition of correspondent dispositions.

In light of Lewis's exposition and standard definition of intrinsicity, we can outline the extrinsic account of the airplane's ability. The essential place of human pilots is licensed by its causal efficacy to bring about the airplane's ability to fly, which can perfectly pass the standard counterfactual test

⁹ Lewis's account stirs up many discussions, for further debates and defense, see Hauska, 2008.

for causality such that the airplane in all relevant possible worlds cannot fly given the absence of human pilots.¹⁰ Thus, there is a good reason to establish human pilots as an essential and extrinsic causal basis¹¹ and, as a result, we have the extrinsic account of the airplane's ability.

3.3 The Relational Intrinsic Account and Composition

In this section, I will present the relational intrinsic account (RIA) of artifact abilities. It differs from the previous two accounts on the point that, according to the RIA, artifact abilities are better not to be considered as ascribed to artifacts *per se*, but as a composition consisting of artifacts and other essential causal bases. In the case of the airplane's ability, it should be ascribed to a composition with two constituents, namely the airplane and the human pilots. Then, the airplane's ability is understood as an intrinsic property not to the airplane, but to the composition. Francescotti's definition of intrinsicity is based on d-relational property, which leaves the space for relational intrinsic property, such as identity relation and the relation between proper parts of the object: my legs are longer than my arms, and this relational property is intrinsic to me (Francescotti 1999:598). The airplane's ability is viewed as something similar from the perspective of the RIA.

Dispositions and abilities that are possessed by compositions or systems have aroused philosophers' interest in many places. The exact configuration of a specific disposition is determined by a constellation of various factors, the selection of which can enhance, diminish, or overtly transform these dispositions. There are some examples of how different compositions generate different dispositions. A nuclear pile is disposed to explode, but some boron rods and a fail-safe mechanism are attached to prevent the catastrophic explosion. Whereas the nuclear pile alone has a strong disposition to explode, the nuclear reactor that takes the nuclear pile, the boron rods, and the fail-safe mechanism will have a drastically diminished disposition (Bird 1998: 229 – 30). Another example. Hydrogen peroxide (H_2O_2) has a disposition to turn into water and oxygen (H_2O and O_2), and this process will be accelerated by some appropriate catalysts. Taking hydrogen peroxide and catalysts as a composition, it has a disposition enhanced and different from that of its constituents (Vetter 2015: 110). Some might worry that there is no genuine difference between dispositions possessed by the composition or by its constituents if the former is reducible to the latter. But this worry can be easily dismissed since there are clearly irreducible dispositions, namely the dispositions of complex systems that have emergent properties.¹² The phenomena are heatedly surveyed by scientists from various subjects¹³, one classical example (Anderson 1972) could be that many-body molecules can manifest a phenomenon understood as broken symmetry, which cannot

10 The simple counterfactual test of causality has severe drawbacks, for example, the epiphenomenal relation passed the test without any causality. This will not draw my attention in this essay.

11 Note that extrinsic dispositions do not always need extrinsic causal bases. Contessa (2011) argues that there are some extrinsic dispositions with some of their causal bases better understood as intrinsic properties ascribe to the external objects. But this argument cannot be applied to the airplane's ability, because the causal bases rooted in human pilots can be ascribed to the airplane as *being such that human pilots are in the cockpit and doing their job*, or ascribed to human pilots as *being in the cockpit and doing their job*. Both properties are extrinsic, therefore the airplane's ability will have an extrinsic causal basis anyway. Perhaps in other cases of artifact abilities, there are extrinsic abilities with intrinsic causal bases, but this does not influence my analysis in the section concerning human beings as an essential causal basis.

12 The initial thoughts about emergent properties are that they are emergent powers, cf. McLaughlin 1998. Or if the dispositional essentialism is correct, then all natural emergent properties are dispositional in nature, cf. Bird, 2007.

13 For philosophical investigation of emergence with a special focus on its application in physic, see Falkenburg and Morrison 2015. And more on physics, biology, and neuroscience, see Bishop et al., 2022.

be explained by appealing to any law of its constituents.¹⁴

These examples will suffice to vindicate the possibility of dispositions possessed by compositions. I now embark on some further characterizations of this kind of disposition. Suppose that dispositions have causal bases, then every instantiated disposition we encounter can be understood as a procedure of events taking place in a certain sequence: it begins with the stimulus condition, goes through its essential causal bases, and finally reaches its manifestation. In the airplane case, it is clear by stipulation that the mechanical structure and human pilots are the only causal bases to be considered. One can still ask how these two factors are interrelated, but since this will be revealed along with the clarification of its stimulus condition and manifestation, let us turn to the investigation of these parts directly.

The stimulus condition concerns where the abilities start. As I have mentioned earlier, the appropriate stimulus condition for the airplane's ability is the operation of human pilots which is in effect an interaction between human pilots and the airplane. For such interaction to obtain, some constraints on human pilots and the airplane must be satisfied: the pilots must be competent in terms of their knowledge and skill to pilot and bodily (and psychological) strength to meet the ordinary demands for pilots; the airplane must be equipped with some control system so that piloting is possible. It is similar to a key's disposition to unlock a certain lock, the stimulus condition of which the insertion of the key involves the interaction and matching between the key and the lock, which in turn imposes some constraints on both sides. This matching is crucial to understanding the airplane's ability, as it echoes the scope of my investigation clarified at the beginning of the essay that the type of artifacts of my concern are designed, manufactured, and supposed to work only in situations where human operators are available.

Now we turn to the part of the manifestation. Vetter (2015) presents some insightful classifications of different types of manifestations that belong to dispositions of compositions (she calls them joint potentialities). The first distinction regards whether the manifestation invokes all or only some of the constituents of the composition (p. 113). It is indeterminate whether the manifestation of the airplane's ability to fly invokes a relation probably due to the vagueness of the meaning of flying. In ordinary language, when someone asserts that an airplane is flying, she does not have to designate a relation between the airplane and the pilots. But this claim hinges heavily on the intuition that the bearer of flying is the airplane but not a composition. After we accept the RIA, will flying then be considered as a relation? I think this question can be left unanswered, since the airplane case cannot represent other artifact abilities in this aspect. There are certainly some artifact abilities that invoke relational manifestation, and some not. Therefore, the first classification will not apply to artifact ability in general. Let us consider the second classification. If the manifestation of (at least, part of) artifact abilities invokes more than one of its constituents, it is suggested that a distinction can be made between plural properties and relations. The difference is that plural properties are not ordered, "[if] P is a plural property, there is no difference between a and b having P on the one hand, and b and a having P, on the other. (p.109)" A similar distinction is made by Pinkert (2014) to distinguish loosely collections of agents from collective agents. According to Pinkert, one salient feature of properties ascribed to collective agents is that they are distributive properties as the properties applied to individual constituent will discriminate the different constituents. For example, the property of forming a circle will differ from that of forming a Mexican wave because the latter requires each participant to know their part of the task.

Putting these together, I have provided, or so I hope, a detailed delineation of the RIA and the

¹⁴ It is controversial whether emergent properties are rare. It is argued that every level of science is corresponding to some emergent properties. Some scholars argue that emergence is about restricted phenomena, maybe only a few things such as mind are emergent (Kim 1999).

artifact abilities ascribed to compositions. In this construal, the airplane's ability to fly is intrinsic for all its causal bases are intrinsic causal bases. The status of human pilots is not only an essential¹⁵ causal basis, but also a proper part of the ability-bearer. Since human pilots are understood as intrinsic to the ability-bearer, the absence of human pilots will reasonably lead to the ability being removed rather than masked.

4 Arguments and Elaborations

The previous section examines three accounts of artifact abilities but has not yet shown which one is the best. In this section, I continue by putting forth arguments in favor of the RIA and reply to some likely refutations.

4.1 From Dispositions to Abilities

A thread of argument is motivated by the question of whether artifacts are really qualified to have abilities instead of mere dispositions. Although there is no commonly recognized distinction between these two concepts, we still tend to think that the term "abilities" is deployed in a sense stronger than dispositions. Whereas dispositions are rather inert properties that require and hinge on the stimulus condition to exhibit or manifest itself, abilities are possessed by agents who will typically have a say over the manifestation of their abilities even when the condition for manifestation is optimal or tempting. Following this intuition, we can distinguish the strong sense of artifact abilities from the weak sense. In the airplane's case, the weak sense of ability to fly is "getting off the ground" as I have stated earlier, the strong sense of ability is flying under the agent's control, "flying to a specific location" for example.

The core concept that facilitates this distinction is the idea of agency. In the discussion of the philosophy of action, agency is always tightly connected with intentional actions. However, this conception is hardly pertaining to artifact abilities which do not take the intention of human agents as the starting point.¹⁶ A more appropriate way to explicate the strong sense of abilities may be to deploy the concept of a two-way power, whose bearer should have control over the exhibiting or refraining of the manifestation. It is generally accepted that this concept should distinguish agentive ability-bearers (e.g. human beings) from non-agentive ones, including all artifacts but not strong artificial intelligence, if any (Frost 2019: Sect. 1). The exact suggestion of this concept is still controversial, some philosophers (Frost, 2019) claim that the agent who possessed a two-way power has control over in which way (between two opposite ways) her abilities can be manifested, others hold (Steward 2020:348) that two-way powers are about how "things might proceed" and "[t]hat the power is 'two-way' would then mean that exercise of the power and also its nonexercise are both possible in the conditions that obtain at the relevant time". Disagreement on this point will not affect my argument.

If we can agree that the concept of two-way powers is one plausible way to establish abilities in a strong sense and that two-way powers are only possessed by agents that can control over the

15 To say that a causal basis is essential in the context of the RIA is to qualify its status as a constituent in the composition. As it will be clear in Sect. 4.2, being causally efficacious is only one requirement of being essential.

16 The airplane's ability may be derived from the composition of further dispositions such as the pilots' abilities to perform certain manoeuvre, which in turn relies on further dispositions. Thus one may wonder why intentions are not starting point of the airplane's ability. In this essay, all abilities in question are individuated with sharpened stimulus conditions and manifestations. The individuation of abilities is controversial (cf. Lowe, 2010), but I have to omit a detailed discussion.

manifestation of their abilities, then we shall acknowledge it as one merit of the RIA over other accounts –since the artifact abilities are ascribed to compositions with human beings as one of the constituents according to the RIA, we can elevate artifact ability to a higher level so that it can be distinguished from mere dispositions.

Challengers may retort to this point on the basis that a property of constituents is not necessarily transitive to the composition: A constituent *x* and other objects compose a composition *y*, but a property *p* possessed by *x* is not necessarily a property possessed by *y*. From this perspective, even if human agents have two-way powers, it does not necessarily imply that compositions involving human agents also have two-way powers. This worry, however, does not apply to the artifact abilities. Let us, again, examine this in the context of the airplane cases. The airplane's ability to fly as a two-way power is rather unique in the sense that it can only be reasonably ascribed to the composition instead of any constituent because human pilots do not have the ability to fly and the airplane does not have control over the manifestation. Therefore, the agency of the airplane's ability to fly is not transmitted from human pilots, but rather an emergent feature of the composition.

To sum up, one advantage of the RIA is that it can promote artifact abilities to a stronger sense so that a distinction between abilities and mere dispositions can be drawn. For those philosophers who regard the control over manifestation or the autonomous agency as a crucial connotation in the concept of abilities understood generally, the RIA will be the most palatable account.

4.2 The Scope of Composition: Arbitrariness and Modal Connection

This section is supposed to reply to the worry that stems from the idea that some restrictions on the composition of ability bearers are needed. The general strategy of the RIA to ascribe abilities is to pick out a range of essential causal bases in the manifestation of abilities and arrange them as a unified composition, but in most cases of artifacts abilities, such compositions seem to lack any inherent and metaphysically salient concatenation. Not any random two objects can constitute a composition non-trivially. Some random object located in my adjacency and I will necessarily engender a spatial relation, but to say that this object and I indeed constitute a composition in this case will be, at best, an arbitrary claim.¹⁷ And the account of artifact abilities in terms of composition is obliged to show that the composite ability bearers are not trivial ones and avoid such arbitrariness.

Therefore, I must provide a principled standard for compositions with concrete upper bounds and lower bounds. While the upper bound explains why a factor must be excluded from the composition, the lower bound explains why a factor must be included in the composition. The lower bound is easier to determine. *Prima facie*, the composition of human pilots and the airplane is not arbitrary, because the tight connection between human pilots and the airplane in the sense that they are one single composition is functionally grounded, as it is conceptualized to lay the metaphysical foundation for the airplane's ability, which must include its essential causal bases as I have introduced in Sect. 3.2. Therefore, the essentialness of causal bases in terms of their causal efficacy demarcate the lower bound of compositions.

This demarcation of the lower bound is supported by further arguments. If we leave the simplified model with two-place relations and turn to more complicated artifact abilities with multiple-place relations, we shall see that it is more arbitrary to ascribe abilities to only one *relatum* than to a composition composed of all *relata*. Consider a navigation application in the smartphone and its ability to show you the right way. If we reject the insight of the RIA and insist to ascribe such

¹⁷ Philosophers may appreciate the universalist view of composition that any two random objects may have joint abilities for different reasons, cf. Vetter 2015. Again, I will set the possibility of universalism aside.

an ability to only one object, then many candidates are equally suitable, such as the program in the smartphone, the smartphone itself, or the corporation that is legally responsible for the application. I cannot envisage any non-arbitrary way to discriminate among those candidates and pick out one of them as most suitable, and the burden of proof is not mine. Another argument is also prompted from this perspective. If one detests the ascription of abilities to compositions, then she will have to find some basic objects that have no parts, which are rare, if not impossible, among artifacts. In the airplane case, it is not controversial that the airplane consists of many mechanical parts and those mechanical parts are typically treated as a well-organized composition for it functionally grounds the complicated dispositions of the airplane. In my view, such kind of ascription has no substantial difference from the RIA unless decisive evidence is shown that the connection among the airplane's mechanical parts is somehow stronger than the connection between human pilots and the airplane.

The remaining problem is how to determine the upper bound of compositions: even if human pilots and the airplane are legitimately nominated as appropriate constituents, it is still arbitrary why only two factors are considered as essential causal bases. This problem will not emerge in the simplified case because there are only two relevant factors and any consideration of upper bounds is redundant. However, in the real-world manifestation of flying, the relevant causal bases are exceedingly more than two kinds. In other words, it is insufficient to explain the essentialness of candidate constituents only in terms of their causal efficacy, there must be another constraint to be added that can serve as the upper bound of composition.

This worry is explicated by Bird (1998, 2007) when challenging the Lewisian analysis that it may allow too many dispositions due to its incapacity in distinguishing finks from antidotes, which permits many nomically possible, but remote and bizarre factors to be the causal bases of dispositions. This refutation highlights the fact that in any real-world manifestation of abilities, they can be masked in innumerable ways caused by bizarre and remote, but efficacious factors. Then the RIA will verge on a dangerous position where its advocates have to embrace all those remote factors as constituents of the composite ability-bearer. Facing this issue, there are two possible ways the RIA could react: one either insists on the original idea and claims that a composite agent, which bears even a very trivial ability, will have countless causal bases; or, one can circumscribe the scope of composition by drawing a distinction among those causally efficacious factors. The first option seems intuitively dubious, and the second option, if successful, will provide the upper bound of compositions.

Here is an attempt toward the second option. To pin down the upper bound, a dimension other than causal efficacy must be added to the essentialness of causal bases. My suggestion is to emphasize the modal connection between antecedent stimulus condition and the consequent manifestation of abilities that is alluded to in the semantic analysis of abilities. Although human pilots and some bizarre and remote factors, say, a butterfly in Brazil, are equally efficacious in the final manifestation of the airplane's ability, human pilots are standing in the stronger connection in a sense that they are not only causally efficacious but modally necessary because it is a necessary consequence for the antecedent of the airplane's ability to obtain. The presence of human pilots is thus necessitated by the formulation of the ability so that in every possible world, human pilots will be an inevitable prerequisite for the ability to manifest. Therefore, human pilots are within the upper bound for it is a prerequisite for the stimulus condition to obtain; whereas a butterfly in Brazil is excluded for it plays no role in the stimulus condition. In summary, the composition of the ability-bearer is not arbitrary with a two-fold criterion for the qualification of constituents: its lower bound is determined by causal efficacy and its upper bound is determined by modal connection.

5 Conclusion

The drastic and rampant development of technology may well incite the pessimist sentiment about the future of our lives embedded in technology, which is often conveyed by a large part of sci-fi fantasies, lying on the precarious philosophical ground and assuming that artifacts are getting increasingly independent and will eventually build up some antagonism against human beings (especially in those tiresome and platitudinous stories about rebellions of robots or artificial intelligence). In contrast, I think that artifacts stand in a profound connection with human beings so that they should not be viewed as separate and heterogeneous from human beings, but as unified ones. I hope my account of artifact abilities and its metaphysical implications can shed light on this issue, as the RIA will necessarily suggest: artifact abilities, no matter how complicated it seems to be, are possessed and amenable to a composition of things, where human being always play an essential role.

Bridging the philosophy of artifact function on the one hand and the philosophy of disposition and abilities on the other hand, this essay is anticipated to bring insights to both parties. For the topic of artifact function, I present a novel angle to unpack the entanglement between human beings and artifacts; for the side of disposition and abilities, I expand the terrain and purview of relevant theories by showing how they can facilitate the philosophical speculation about phenomena and issues in our daily life.

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