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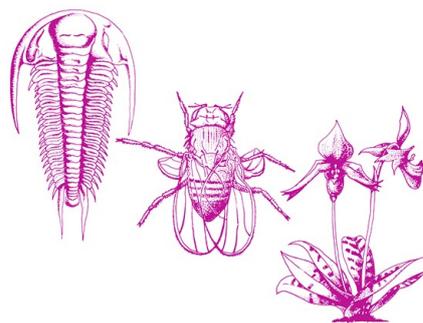
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Philosophical problems, cluster concepts, and the many lives of Molyneux's question



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Abstract Molyneux's question, whether the newly sighted might immediately recognize tactilely familiar shapes by sight alone, has produced an array of answers over three centuries of debate and discussion. I propose the first pluralist response: many different answers, both yes and no, are individually sufficient as an answer to the question as a whole. I argue that this is possible if we take the question to be cluster concept of sub-problems. This response opposes traditional answers that isolate specific perceptual features as uniquely applicable to Molyneux's question and grant viability to only one reply. Answering Molyneux's question as a cluster concept may also serve as a methodology for resolving other philosophical problems.

Keywords Molyneux's question · Blindness · Perception · Cross-modal transfer · Cluster concepts · Cataract experiments

Where do philosophical problems go when they die?

As philosophical puzzles, thought experiments, and other philosophical problems mature they have a propensity to fail their intended purpose. Mary's room—whether a neuroscientist, naïve about color experience but knowledgeable of all of color's physical facts, would learn a new fact at the first experience of color—is such an example, failing Frank Jackson's intended use as a metaphysical argument against physicalism.¹ However, this problem retains its influential standing in its application

¹ See Frank Jackson, "Mind and Illusion," in Nagasaw et al. (2004).



to numerous and different issues: the ineffability of perceptual content,² the existence of phenomenal concepts,³ and the study of consciousness in general.⁴ Goodman's Grue riddle,⁵ Searle's Chinese room,⁶ and Chalmers' zombies,⁷ have likewise matured and taken on lives of their own. Can it be said that these unforeseen philosophical explorations are explanations of their original philosophical problem? Or might it be that these new explorations read as eulogies? As Alex Byrne advises of Mary's room "Since Mary has outlived her usefulness as a poster child for the qualia freaks, she should be killed off."⁸ When philosophical problems generate multiple kinds of questions and answers, their specificity is undercut and their objective becomes indeterminate.

Like Byrne, Robert Hopkins argues that the especially mature problem of Molyneux's question—whether the newly sighted might immediately recognize tactilely familiar shapes by sight alone—may have outlived its use:

[I]t is far from obvious what Molyneux's problem is really about. What issue, or issues, of a more general and theoretical nature, does it raise? Since this is unclear, it is also unclear whether Molyneux's problem still matters today (2005: 441).

Byrne and Hopkins' arguments present a dilemma generalizable to other maturing philosophical problems:

Either philosophical problems concern a specific issue of importance, in which case only a chosen few answers are relevant, or are ill-formed queries with issues too diverse to address with a single analysis.

Maturing philosophical problems like Mary's room and Molyneux's question are no longer limited to their intended uses, making their survival questionable.

We should, however, be optimistic about the survival of philosophical problems whose specific intent has been overshadowed by unanticipated use. I argue that Hopkins' own case example, Molyneux's question, thrives in its generality. The reason, I suggest, is that philosophical problems are best understood as a cluster concept of disjunctive sub-problems where an account of one sub-problem is a sufficient answer for the whole. In other words, a problem's 'all-purpose' status does not forbid single successful replies. I turn now to briefly consider how Molyneux's question thrives in its generality and how cluster concepts might account for this possibility.

² See Byrne (2002).

³ See Michael Tye, "Knowing What It Is Like: The Ability Hypothesis and the Knowledge Argument" in Ludlow et al. (2004).

⁴ See David Chalmers, "Phenomenal Concepts and the Knowledge Argument" in Ludlow et al. (2004).

⁵ Stalker (1994).

⁶ Preston and Bishop (2002).

⁷ Kirk (2006).

⁸ Byrne (2006).

The afterlife of Molyneux's question

Molyneux's question was first published in Locke's *Essay* as follows:

Suppose a Man born blind, and now adult, and taught by his touch to distinguish between a Cube, and a Sphere of the same metal, and nighly of the same bigness, so as to tell, when he felt one and t'other, which is the Cube, which the Sphere. Suppose then the Cube and Sphere placed on a Table, and the Blind Man to be made to see. Quære, Whether by his sight, before he touched them, he could now distinguish, and tell, which is the Globe, which the Cube (Locke 1694/1979)

Consider the possibility that “yes,” the newly sighted succeeds in visually confronting two tactilely familiar shapes: she identifies which is the cube and which the sphere.⁹ How? Does she utilize her imagination to construct a visual representation from her previous tactile knowledge (Leibniz 1760)?¹⁰ If so, does she employ geometrical, behavioral, or some other kind of representation, like sensori-motor contingencies (Noë 2004)? Or does she simply recognize which shape is which from her previous tactile experience because of their experiential similarity (Campbell 1996)?¹¹ Might the brain have employed supra-modal pathways that transfer tactile neural representations to visual recognition centers (Held 2009); or perhaps sense-specific representations “converge” in temporal binding (Prinz 2002); or might supra-modal neural representations themselves be employed (Pascual-Leone and Hamilton 2001)? If so, are *they* geometrical, behavioral or were other properties of the shape utilized, like the egocentric spatial coordinates of their parts (Evans 1985)?

These selected answers, all of which focus on how the newly sighted might come to identify shapes, range over multiple levels of explanation and disciplines of study. Some focus on the neural basis of shape recognition, others the phenomenological experience of shape, or behavioral responses, mental states, the conceptual repertoire involved, not to mention the epistemological standing of the recognitional states and the metaphysical assumptions in play, each of which are explanatory features of Molyneux's question. Not only are there various ways for the newly sighted to see and as we'll discuss, fail to see, there are different

⁹ Historically, the *failure* of the newly sighted to identify shapes was status quo, but even this admitted of multiple explanations. For instance, though both Locke and the question's author, William Molyneux, took the question as of support Empiricism, Molyneux argued that the question suggested the heterogeneity of the senses of sight and touch while Locke argued that the question showed how our visual perception requires perceptual learning or “improvement.” As Locke wrote: “This I have set down, and leave with my reader, as an occasion for him to consider how much he may be beholden to experience, improvement, and acquired notions, where he thinks he had not the least use of, or help from them”. (*Essay* II.ix.8) What Locke's own specific explanation amounts to is one of the more intriguing debates in Lockean scholarship. See Bruno (2010).

¹⁰ Leibniz likely answered the question by utilizing geometrical images of touch and sight for shape recognition. Whether he thought that the imagination was employed unconsciously or consciously is discussed by Glenney (2012a).

¹¹ Campbell (1996) suggests that only small differences exist between tactile and visual experiences of shape, akin to differences in accent rather than language.

organizational levels, such as those isolated by Marr (1982), that deserve attention (Bechtel 1990). If Molyneux's question is considered in its generality, then it becomes an interdisciplinary problem and many levels of explanation are of interest.

It is argued by some, like New Wave reductionists: Churchland (1986), Churchland (1989), and Bickle (1998), that a neuronal level of explanation is essentially more important than other levels of explanation, such as the behavioral and psychological. However, as Marr recognized, the multifarious character of perception suggests otherwise. Marr's respect for organizationally autonomous levels of explanation provides an *interdisciplinary and multi-leveled* model for the study of the multifarious aspects of Molyneux's question, which begin with the acquisition of spatial form by touch alone and end with the visual identification of spatial form. That these steps, and those along the way, can be treated in a modular manner is further suggested by the fact that historically each aspect has been a focus of contentious debate (Morgan 1977; Degenaar 1996). For instance, just how much spatial information we are able to acquire by touch remains unclear, though we now know that those with visual deficits are more adept at this task (von Senden 1960; Cattaneo and Vecchi 2011). This point also demonstrates that the sub-problems that constitute Molyneux's question are themselves in motion: the status of one part, like a subject's level of blindness, will influence the status of others down the line, like acquisition of shape by touch. Hence, any answer to Molyneux's question may become a rather complex account of moving sub-parts.

In addition, forms of reductionism are not sufficient to account for this complexity, as there are multiple explanations of what might be considered the "physical level," each of which can be considered worthy of an account. The newly sighted may succeed in identifying shape in either of two distinct processing pathways: a ventral pathway for consciously identifying "what" an object is, and a dorsal pathway for behaviorally responding to "where" spatial features lie in behavioral space (Goodale and Milner 2004; Evans 1985). On the other hand, causes for failing to recognize shapes may be due to residual effects of either optical or cognitive blindness.¹² For instance, some subjects who have undergone cataract removal surgery demonstrate specific, sometimes long-term, cognitive delays (Fine et al. 2003). These delays manifest themselves in visual processing areas either at Intermediate-Levels (V1–V5) which inhibit the ability to identify line orientation, boundaries, color, etc., or Higher-Level areas which lead to eccentric forms of blindness (Downing et al. 2006), including blindsight, and other specific forms of agnosia (Farah 2004).¹³ The number of ways to see and the variety of kinds of visual deprivation all directly related to the physical level alone suggest that there are a number of ways in which the newly sighted might both succeed and fail in shape recognition.¹⁴

¹² This distinction between optical and cognitive blindness indicates that most blind subjects are in fact "double blind." See Noë (2004: 12).

¹³ For a recent review of these studies, see Cattaneo and Vecchi (2011: 98–102).

¹⁴ It should be noted that many different experimental paradigms have been utilized in answer to Molyneux's question, from testing eye movements of newborn infants (Streri and Gentaz 2003), to phosphene pattern recognition in blind subjects (Delbeke and Veraart 2006), to sensory substitution devices on sighted subjects (Pacherie 1997).

In sum, if Molyneux's question is general and unspecified in intent, it thrives in multi-leveled and interdisciplinary studies on a complexity of processes with diverse theoretical implications and empirical paradigms. Yet, if Molyneux's question encompasses a wide range of interests, levels and kinds of explanations, with a wide variety of empirical considerations,¹⁵ then there exists no unproblematic way to determine a single "best" or "correct" answer. In a sense, each of these answers to Molyneux's question may be "correct." How is this possible?

Accepting Molyneux's question in its generality may *not* be possible. As Hopkins argues, we should treat the question in its specificity and attempt to, "defend a particular conception of what the question is about. (...) I defend its significance by arguing that it provides the best expression of our curiosity about *the way* in which touch and vision represent things" (2005: 441, 444). However, the above discussion provides initial support for rejecting 'best expressions.' Any specificity may entail the exclusion of constitutive aspects of the visual or tactile perceptual process. For instance, the experimental paradigm described in Molyneux's question requires that the newly sighted individual remain immobile, a feature which fails to appreciate certain features of perception of interest today such as behavioral activity. As authors of a recent study on cross-modal integration and behavior lament:

[N]eural representations across the brain may be centered on specific actions. This view on neural representations puts 'Molyneux's Problem' in a new light. Unisensory signals are fused into multisensory motor representations unified by an action, but since Molyneux does not suggest any action, his 'problem' may be better viewed as an ill-posed question – at least from a neuroscientific perspective (Ghazanfar and Turesson 2008: R1143)

In addition, if the question is understood in its specificity, it is unable to include controls for investigating certain aspects of the visual or tactile perceptual process. For instance, the effects of long-term visual deprivation on the optical or cognitive mechanisms of vision require a significant time of healing between sight restoration and shape recognition.

These negative effects are the basis of a venerable objection to using patients of cataract surgeries as subjects for experimentation on Molyneux's question made by a number of past philosophers including: La Mettrie (1750), Jurin (1738), and Adam Smith (1795).¹⁶ The more we come to understand the complexity of the effects of long-term visual deprivation, the more varied the complaint has become. Cattaneo and Vecchi (2011) show skepticism of the *optical acuity* had by such subjects, "[I]t would be wrong to answer the Molyneux's (sic) question on the basis of the results of such "primitive" operations...since the available surgery did not allow a decent retinal image for weeks or months (99)." M. Degenaar has reservations about the

¹⁵ For a review of empirical work on Molyneux's question see, Molyneux's Question: Section 5 Development as an Empirical Problem." See Glenney (2012b).

¹⁶ Regarding the quickness of recovery of Cheselden's subject, Adam Smith writes, "In him this instinctive power, not having been exerted at the proper season, may, from disuse, have gone gradually to decay, and at last have been completely obliterated. Or, perhaps, (what seems likewise very possible,) some feeble and unobserved remains of it may have somewhat facilitated his acquisition of what he might otherwise have found it much more difficult to acquire." (Smith 1795, Section 69).

efficacy of the *cognitive processes* because, “congenitally blind people cannot be made to see once their critical period is passed” (Degenaar 1996: 132).¹⁷ Andrew Meltzoff (1993) worries about the degenerated condition of *crossmodal* cognitive processes in once-blind subjects:

These [cataract] studies have not provided a clear answer to Molyneux’s question, primarily because of one major stumbling block. That is, it is difficult to draw firm conclusions about the initial, unlearned relation between touch and vision (the subject of Molyneux’s question) from adult patients who have suffered a lifetime of visual deprivation (blindness) and may therefore have experienced abnormal development and/or degeneration of various sorts.

The temporal immediacy required by Molyneux’s question at the root of this issue is, however, negotiable if we forgo treating the question in its specificity. For instance, Janet Levin (2008) has suggested a modification to Molyneux’s question of replacing temporal immediacy with “epistemic” immediacy, where time for healing is given to the newly sighted subject between visual restoration and shape recognition, while assuring through controls that subjects remain experientially and inferentially naïve regarding identifying shapes by sight alone. In fact, many modifications to Molyneux’s question: using two-dimensional shapes (Diderot 1749), employing geometers as subjects (Reid 1764), and providing a “hint” to the subject regarding the kinds of shape they are required to identify (Leibniz 1760), all further suggest that, as stated, Molyneux’s question is ill-formed if understood as a question that concerns a specific issue of importance, like cross-modal transfer of shape representation.

To resolve this dilemma we must, I argue, interpret Molyneux’s question as a general query. In doing so, we must also avoid the objection that the question deals with issues too diverse to address with a single analysis. But how? I argue that we can do so by treating Molyneux’s question as an orchestra of sub-problems—a “problem cluster”. This “problem-cluster” view of Molyneux’s question provides a novel theory of philosophical problems in general that shows Molyneux’s question, rather than being ill-posed, to involve a complex set of cognitive systems, each part unique and equally relevant to explanation of the question. Hence, we should expect that Molyneux’s question is answerable by a plurality of distinct replies, running in a parliamentary system, as it were, rather than two-party system. Understanding how exactly this is possible can benefit from considering a similar practice for other explanations.

¹⁷ Degenaar claims that the cataract paradigm is the only method for testing Molyneux’s question, but cannot do so. Thus, there is no answer to the question. This seemingly “literalist” reading of Molyneux’s question poses a unique challenge to the plurality reply that is distinct from the sectarian views of Hopkins and others. For instance, on the literalist reading, the cataract paradigm *is* the only way to empirically study the question. But this is precisely the problem with the literalist reading. Taken literally, the question does not prescribe the specific testing paradigm of cataract removal. In addition, most cataract patients have limited luminance detection and some can even detect differences in color. Though lacking in perception of form, are these good test subjects, given the fact that they are not completely blind? A literalist reading fails to provide a non-arbitrary answer to this important question. Molyneux’s question lacks the kind of specificity that the literalist reading requires, offering neither a specific testing paradigm nor a distinctive subject pool. Thus, the literalist reading preferred by Degenaar is a non-starter. In addition, as I will argue, Held et al. (2011) outright undercuts Degenaar’s proposal.

Molyneux's question as a cluster concept

An account of proper nouns developed by Searle (1958) and Strawson (1959),¹⁸ suggests that a cluster of predicates, each sufficient for describing the referent, constitutes the meaning of names. 'David Foster Wallace,' for instance, is constituted by a myriad of disjunctively sufficient predicates: 'The writer of *Infinite Jest*' or 'the GS-9 examiner at IRS post 047, or American citizen with SSN 975-04-2012, etc. and any of these predicates is sufficient for determining the referent. Cluster concepts have since been used to account for laws of nature (Putnam 1962), the nature of art (Gaut 2000), the nature of psychological theories of mind (Bermudez 2005), and most recently the concept of species (Magnus 2012). In other words, treating these phenomena as cluster concepts accounts for how single answers in a particular level of explanation by a specific discipline of study can be considered sufficient to account for the whole.

Berys Gaut, for instance, describes his cluster account of art as follows:

[T]he cluster account also claims that if fewer than all the criteria are instantiated, this is sufficient for the application of the concept. Second, there are no properties that are individually necessary... Third... there are disjunctively necessary conditions: that is, it must be true that some of the criteria apply if an object falls under the concept.¹⁹

This description can be formulated into an argument as follows²⁰:

1. Properties P, Q, ... , Z and their proper subsets {P, Q, ... , Z} are sufficient disjunctively for a cluster concept C.
2. No member of P, Q, ... , Z or their proper subsets {P, Q, ..., Z} is necessary for C.
3. At least one of P, Q, ... , Z or their proper subsets {P, Q, ... , Z} must necessarily be instantiated.
4. If premises (1–3) hold for O, then O is a cluster concept.
5. Premises (1–3) hold for O.
6. Thus, O is a cluster concept.

Consider (1) to mean that a concept C consists of its properties (P–Z) and their proper subsets {P–Z} and (2) to mean that none of these properties is itself necessary to define or account for C and (3) to mean that only one of these properties need be instantiated to define or account for C. For instance, an art object may be intellectually challenging, but lack positive aesthetic qualities or formal complexity and coherence or any other criteria one might suggest as necessary for being an art object, and yet still be considered art.

Might Molyneux's question be a cluster concept as described above—constituted out of sub-problems such that an account of any one or more of them is a sufficient answer for the whole? To evaluate this possibility we need to determine if Molyneux's

¹⁸ For a recent appraisal, see Devitt and Sterelny (1999).

¹⁹ Gaut (2000: 26–27).

²⁰ Premises 1–3 are developed from Longworth and Scarantino (2010).

question meets conditions (1–3) above. I have presented some reasons above for why Molyneux's question satisfies (1)—why it can be considered a problem composed out of many sub-problems. Next I intend to argue that it meets conditions (2) and (3), that none of these sub-problems are necessary features for accounting for Molyneux's question and that any one of them or their subsets is sufficient.

To show this, I further explore the above-mentioned contentious sub-problem of whether an account of the negative effects of visual deprivation is alone sufficient to account for Molyneux's question. Recall that this sub-problem is generally viewed as not relevant to Molyneux's question. If it can be shown that the negative effects of visual deprivation *are* relevant to Molyneux's question and sufficient for a full answer, then we can garner a strong basis for thinking that condition (3) is met by Molyneux's question and an account of any sub-problem is sufficient. Furthermore, if this arguably non-relevant feature *is* actually sufficient, it also suggests that condition (2) is met, as the more clearly relevant features, such as the neural basis for shape recognition, are *not* necessary for an answer to Molyneux's question.

Inclusive answers and the cataract paradigm

After couching a child's cataracts and allowing some time to heal, Cheselden (1728) observed that the child could neither recognize colors,²¹ see distance, discern size, nor identify shapes. Nearly a hundred similar reports from the nineteenth and twentieth Centuries supported Cheselden's initial observations (von Senden 1960). These negative results have persuaded many philosophers and psychologists of a single negative answer to Molyneux's question.²² For one, the cataract paradigm appears to be the most proximate empirical rendering of the question (Degenaar 1996). Two, recent studies that utilize modern experimental standards of research are in general agreement with Cheselden's findings (Ostrovsky et al. 2006; Gregory 2003). However, all of these studies suffer from experimental flaws: subjective reporting of the subjects' verbal reports, unverified visual acuity of the post-operative subject, or testing after subjects had experiences that allowed them to make correlations between sight and touch.

Held et al.'s (2011) recent experimental work, however, is not susceptible to these problems because an added control ensures full restoration of sight; all subjects were able to first match shapes by touch and separately match shapes by sight. Yet, these subjects *also* failed to match seen shapes previously recognized by touch. This strongly suggests that the cataract paradigm supports a particular and singular negative answer to Molyneux's question based on a failure of cross-modal transfer of tactile representations of shape due to long-term visual deprivation. As Held explains in a previous paper (2009), the senses of sight and touch require coordination if they are to be used in conjunction. Long-term visual deprivation

²¹ Cheselden's subject had previously experienced colors as an infant—his cataracts were not congenital—and with cataracts he could even discern some colors in good lighting conditions.

²² George Berkeley (1933/1975) considered Cheselden's report confirmation of his negative reply, as did many French Philosophers such as Voltaire (1738/1967). The more recent reports confirmed Cheselden's findings for many scientists, including the influential psychologist (Hebb 1949).

perturbs this coordination in a way that requires re-mapping via experiences that correlate the tactile to the visual. Blindness, then, becomes an extreme form of failing to match one's visual experiences of objects with tactile experiences of objects. Hence, it appears that the study of long-term visual deprivation indeed provides a sufficient account of a negative answer to Molyneux's question.

It is important to note that there may be reason to think that other explanations of the failure of cataract surgery subjects to identify the shapes are also viable. Given the lack of experimental controls, it is unlikely that subjects from all of the cataract paradigm experiments failed to recognize the shapes for the same reason. The distinction between optical and cognitive blindness mentioned above suggests that perhaps some of the subjects retained a degree of optical blindness from insufficient recovery time and simply lacked visual acuity. Others may have had cognitive delays due to the reorganization of the cortex that often occurs when a sense is deprived for significant lengths of time. The cataract paradigm thus suggests at least three distinctive kinds of negative answer to Molyneux's Question: optical healing, cognitive adaptation in vision, and cross-modal cognitive adaptation. Is not each of these a sufficient basis for a negative answer to Molyneux's question?

One may object to this inclusive answer and argue that only Held et al.'s (2011) conclusion is applicable, providing the only explanation relevant to the relationship between sight and touch. The general complaint is that the results of the cataract paradigm prior to Held's work are not relevant enough to the original intention of Molyneux's question and thus cannot be considered sufficient answers. This argument may be understood as follows:

1. Molyneux's question concerns the relationship between the senses of touch and sight.
2. The cataract paradigm tests the physiological and cognitive effects of visual deprivation.
3. The physiological and cognitive effects of visual deprivation are unrelated to the relationship between the senses of touch and sight.
4. So, the cataract paradigm is not related to Molyneux's question.

Premise (1), however, relies on privileging the "original intention" of Molyneux's question as about the relation between sight and touch, or at least what is traditionally viewed as fundamental. Yet Molyneux's original intention is itself unclear. For one, Molyneux's first letter to Locke included a query about the ability of the newly sighted to identify not only the shapes, but their very distant location, "20 or 1,000 feet from them," which manipulates visual sizes of the shapes, a property not available to touch at all.²³ Perhaps, then, Molyneux's original reason for including "touch" served more as a control for determining whether ideas are acquired by visual experience full stop and arguing for empiricism generally.²⁴ Locke's own design in publishing Molyneux's question

²³ "Or whether he could know by his sight, before he stretched out his hand, whether he could not reach them, tho they were removed 20 or 1,000 feet from him?" Locke (1978), Vol. III, July 7, 1688, letter 1064, pp. 482–483.

²⁴ Molyneux was an advocate for the "new learning"—the experimental philosophy of the *Royal Society* that advocated Locke's empiricism. He founded The Dublin Philosophical Society, translated works by

was likely to support his claim that the mind learns to see—that the mind habituates itself to visual experience. Perhaps, then, this “originalist” reading of Molyneux’s question should prefer answers related to utilization of ‘untrained’ visual experiences. A liberal reading, however, avoids this tension over fundamentals. It also provides a basis for productivity, allows variegated interests in the question, and allows for flexibility between Molyneux’s Question and its empirical instantiation.

Lastly, empirical evidence suggests that premise (3) is false; we can learn about the relationship between sight and touch by considering effects of visual deprivation. This is demonstrated by a modification in Held et al.’s (2011) study, which retested their newly sighted subjects’ ability to identify shapes a few days after their initial test and each of which were successful. In a final analysis, the authors conclude that their evidence “suggests a more nuanced answer of “initially no but subsequently yes” (Miller 2011).” In other words, visual deprivation *causes* transfer failure rather than preventing the making of cross-modal representations: “The rapidity of acquisition suggests that the neuronal substrates responsible for cross-modal interaction might already be in place before they become behaviorally manifest (Held et al. 2011: 552).” Held et al. conclude that the neuronal structure for cross-modal transfer is available but not utilizable due to its degenerated state caused by visual deprivation. This evidence also suggests that the empirical and the theoretical are not in conflict as some have argued (Gallagher 2005; Jacomuzzi et al. 2003; Ghazanfar and Tureson 2008), a claim I discuss in greater detail just below. In sum, the re-testing evidence emerging from Held et al.’s experiments about the unexpected quickness of recovery of cross-modal transfer demonstrates that such a modified cataract paradigm is in support of an affirmative reply if one’s concern is cross-modal transfer. However, if one’s interest in the question concerns the effects of long-term visual deprivation, the modified paradigm supports a negative answer.²⁵ In sum, these two maximally diverse answers, “no” and “yes,” provide a clear case of the plurality of answers possible for Molyneux’s question as they concern distinctive areas of study: visual deprivation and cross-modal transfer.²⁶

Footnote 24 continued

Galileo and Descartes, and published many papers in the Royal Society’s *Philosophical Transactions*. He also worked on problems of vision and optics, writing treatises on the moon illusion, double vision, and telescopes later collected and published in his book *Dioptrica Nova* Molyneux (2000). This background gave him a sufficient understanding and interest in experimental design and problems in vision with little indication of an interest in the relationship between vision and touch, further suggesting an alternative motive for his question.

²⁵ It might even be said that the delayed testing of the subjects in the modified version strengthens the support for a negative answer regarding visual deprivation effects, as it shows that the subjects eventually do have the capacity for recognizing tactually familiar shapes by sight alone though decidedly not at first sight.

²⁶ In addition, these explanations exist on the same level of explanation and discipline of study. As Held (2009) explains, the later recognition of shapes by the newly sighted is evidence of the function of *neural* processes—the neural representations underlying visual shape recognition, processes which are not utilizable until further visual and tactile experiences enable cognitive re-mapping of the cross-modal transfer pathways.

In addition to originalist and the more liberal interpretations prompted by Held et al.'s experiments on cataract patients, Gallagher (2005) proposes to “cut and run,” to distinguish empirical and philosophical Molyneux questions and find the latter to be most salient to the intent of the question. Gallagher claims that the empirical question must be answered “no” given that there is significant neural degeneration of the visual cortex in blind subjects. However, the philosophical query, being about the relationship between sight and touch, should be answered “yes” given the possibility of an idealized subject not affected by the effects of visual deprivation. Ghazanfar et al. also employ this distinction though are less optimistic about the empirical results, “Although it may turn out to be impossible to verify empirically, Molyneux’s query still represents a fascinating “thought” experiment... (Ghazanfar and Turesson 2008; see also Jacomuzzi et al. 2003).” This strategy essentially reformulates the first premise as follows:

(1*) *The philosophical issue of Molyneux’s question concerns the relationship of the senses of touch and sight.*

The problem with this line of response, however, is that it delimits the implications of empirical work on philosophical issues. Held et al.'s (2011) study shows that cataract experiments do directly relate to sight and touch. (I supplement this claim in the next section by showing that Held’s study also provides a basis for an important theoretical distinction in the long tradition of the empiricist thesis of sensory heterogeneity.). The cut and run strategy, then, is less attentive to potentially related experimental work, and seems more in response to the primitiveness of the early forms of the cataract paradigm than the actual condition of the newly sighted. This evidence suggests that the empirical and the theoretical are not in conflict, undercutting motivation for the cut and run strategy.

However, it could be argued that, with a change to Premises (1) (see above) and (2) to reflect the results of the modified cataract paradigm, we get a modified argument against utilizing the cataract paradigm to answer Molyneux’s question:

(2*) *The cataract paradigm tests the physiology of the relationship between sight and touch.*

(3*) *The physiology of the relationship between sight and touch are not related to the philosophical issue of the relationship of the senses of touch and sight.*

(4*) *So, the cataract paradigm is not related to Molyneux’s question.*

The question, then, centers on the relationship between the philosophical and the physiological issues regarding the relation between sight and touch.

This modified argument fares no better than its ancestor. First, premise (3*) places an incorrect restriction on the influence of physiology for the philosophical understanding of the relationship between sight and touch. Surely, physiology affects phenomenology, which in turn influences one’s conceptual repertoire. For instance, a fourth cone pigment would enable the experience of exotic colors to humans and the acquisition of novel color concepts, recognition ability, etc. Second, premise (3*) again restricts the use, even the favorable use, of the cataract paradigm for answering Molyneux’s question. As discussed above, the re-testing evidence emerging from Held et al.'s experiments about the unexpected quickness of

recovery of cross-modal transfer demonstrates, if anything, that such a modified cataract paradigm is in support of an affirmative reply if one's concern is the purportedly philosophical issue regarding the existence of cross-modal representations. However, if one's interest in the question concerns the effects of long-term visual deprivation, the modified paradigm supports a negative answer. But it is not so much that one can be justified in a negative answer to Molyneux's question empirically, but that there is a productive value to treating Molyneux's question as interdisciplinary, even across the seemingly wide gap between science and the humanities. I argue that treating Molyneux's question in its generality provides a demonstration of how empirical experiments might generate novel philosophical distinctions in long-standing theoretical positions, such as the Empiricists contention that the senses are heterogeneous.

Philosophical distinctions from empirical experiments

As mentioned above, Held et al. (2011) view their modification on the cataract paradigm as a demonstration of transfer failure—a failure of shape representations used in tactile recognition to transfer adequately for visual recognition:

The newly sighted subjects did not exhibit an immediate transfer of their tactile shape knowledge to the visual domain. This finding has important implications for bimodal perception. Whatever linkage between vision and touch may pre-exist concomitant exposure of both senses, it is insufficient for reconciling the identity of the separate sensory representations. (552)

If newly healed cataract subjects fail to recognize shapes known by touch, they cannot utilize cross-modal sensory representations, representations that can be employed by both sight and touch, which likely exist given the success of the promptly retested subjects. This appears to be a philosophically relevant consequence of their experiment, particularly as it directly relates to the answer given by Molyneux himself. However, there are two ways to interpret this evidence. Sensory-specific concepts used in recognizing the shapes are either *essentially* or *functionally* heterogeneous.

Molyneux's own response, as interpreted through the lens of the Empiricism he advocated,²⁷ is an example of essential heterogeneity:

I answer not; for tho he has obtain'd the experience of how a Globe, how a Cube affects his touch; Yet he has not yet attained the Experience, that what affects my touch so or so, must affect my sight so or so; Or that a protuberant angle in the Cube that pressed his hand unequally, shall appear to his eye as it does in the Cube (Locke 1694/1979).

²⁷ Molyneux's stated answer is ambiguous about a number of particulars and distinctions now common to any analysis of Molyneux's Question. For instance, he employs what appears to be a proto-phenomenological reply, focused on what must be the case given the nature of the experience of the newly sighted. However, the context of the question; written as a query to Locke whom clearly influenced the Molyneux's thought on this topic, suggests that Molyneux's point of concern was the epistemology of concepts and their acquisition by experience alone.

If what individuates the senses are their distinctive phenomenal properties,²⁸ the felt corner of a cube—a “pokey” feel—would not at first appear to the eye in the same way as the seen corner of the cube—“disjointed” look. Hence, the senses are essentially heterogeneous. Only with time and experience might one make the appropriate associations needed in order to see something as the same thing previously experienced by touch.

Held et al. (2011) also advocates essential heterogeneity as a possible explanation for why cross-modal transfer is learned rather than innate; it makes evolutionary sense:

A dynamic mapping based on experience would indeed be preferred if the representations of the visual and haptic features are not entirely predictable in advance of experience. The representation of haptic features, for instance, may change as the body undergoes physical alterations throughout development, requiring updated correspondences between physical features and proprioceptive feedback. In vision, improvements in acuity and object segmentation strategies throughout the first year of infant development may require new representations for features that were not perceivable previously (2011: 552).

The visual system cannot employ a tactile representation of a cube acquired by stagnate innate concepts. It is better to have one's concepts grow with their body.

Held et al. (2011) transfer dynamism is supported by studies in perceptual perturbation—cases where normal perceptual experience and behavior is temporarily disturbed by devices such as inverted goggles, but is quickly recovered.²⁹ Though one's reaching behavior is temporarily upset by lenses that make the visual world turn upside-down, such that when I see myself reaching to the right, I feel myself reaching to the left, in a matter of days my behavioral propensities will reorient to normal behavior.³⁰ When the perturbation is removed, the behavioral effect remains—an aftereffect showing the persistence of the behavioral propensities (Held and Freedman, 1963). How is this so? Held (2009) reasons that discrepancies between my felt movement and seen movement provide parameters for correction (rather than just an “error signal”), allowing the subject to “re-map” spatial congruencies along the new parameters, the aftereffect showing additional support for this explanation. Held (2009), then, considers long-term visual deprivation to be a kind of perceptual disturbance that the brain quickly corrects:

Initially *there should be no map* of combined visual-haptic space. Just as in prism perturbation, the spatial representations are likely to be discrepant and cross-modal identification absent. But the cross-modal interaction...should quickly map common loci for objects detected by both senses. (597, my emphasis)

²⁸ Molyneux conflates precisely what individuates the senses: the different properties of objects to which they are tuned to acquire or the different experiences that they generate.

²⁹ See Stratton (1897) for an early study on the experiential effects of inverted goggle use and Linden et al. (1999) for an update.

³⁰ “Subjects, who wore prism-and mirror-inverting spectacles over periods of 6–10 days, showed a rapid visuomotor adaptation and were able to interact correctly with the surrounding world after a few days.” Linden et al. (1999: 480).

Dynamic transfer makes evolutionary sense, is empirically confirmed, and provides support for Molyneux's own negative reply that the sensory concepts are essentially distinct. It also provides a basis for the theory that the senses are inherently heterogeneous.

It is, however, doubtful as to whether the application of the perturbation studies are best accounted for by essential heterogeneity. For one, the claim that there exists no re-mapping, and that a new map is drawn *in toto*, does not correspond to the fact that, as these studies often show, the aftereffects of blindness and perturbation last for a similar amount of time (approximately 5 days). Drawing an entirely new map in cases of full visual deprivation would seem to require a greater amount of time. Two, the retests from Held et al. (2011) suggest a largely correct mapping between sight and touch (~85 %) that needs little coordination between these senses. For, it seems likely that creating a coordinating map from scratch would need a significantly greater amount of re-calibration, requiring more time than a few days with a lower accuracy than ~85 % correct identification of the shapes. Both points suggest that there is a closer relationship between perturbation and deprivation in that *both* incur a *re*-mapping rather than a 'map making.' In other words, the senses are not essentially heterogeneous. Perhaps this is why Held et al. appears to revise his view in his later paper (2011) stating, "The rapidity of acquisition suggests that the neuronal substrates responsible for cross-modal interaction might already be in place before they become behaviorally manifest."³¹ In other words, cross-modal maps may pre-exist visual experience. If perturbation and deprivation are comparable and cross-modal maps indeed pre-exist visual experience, then this is a disconfirming case for the basis of Molyneux's own answer and Held's (2009) assumption. Importantly, it also demonstrates an advantage of employing empirical research in considering philosophical theories, providing a novel view of "functional heterogeneity" of the senses.

The conclusion offered by Held et al. (2011) is that, at the philosophical level, both Molyneux and Locke were wrong: the quick recovery of the newly sighted suggests inborn homogenous sensory maps for shape recognition whose use does not require perceptual learning but rather re-calibration. Hence, Held et al.'s plurality reply gives both a negative answer to the empirical question—the newly sighted are not physically able to immediately recognize tactilely familiar shapes by sight alone—and affirmative answers to a philosophical issue of concern—the newly sighted would have been able to recognize tactilely familiar shapes by sight alone were the physical affects of visual deprivation not present. This is not a 'cut and run' answer, but rather an answer that divides and conquers—an answer advocated by a plurality reply to Molyneux's question.

Conclusion

The 'plurality of answers' conclusion should not be surprising given the complexity of issues surrounding Molyneux's question. But what is it about these issues that can

³¹ Held et al. (2011: 533).

be said to be *about* Molyneux's question? Is it that they are merely identifiable as sub-problems of Molyneux's question? If so, what are the criteria for so identifying a sub-problem? If we so identify a sub-problem, must not we exclude sub-problems that fail this criteria? For instance, if long-term visual deprivation is identified as a sub-problem, must we not exclude subjects who are not once-blind, like infants (Streri and Gentaz 2003)? Are shapes the only relevant stimuli or might numbers be used (Van Cleve 2007)? Must shapes be three-dimensional or can they be made up out of mere dots (Evans 1985)? Must the subject be able to identify "immediately" the shapes or can there exist a temporal delay (Levin 2008)? In sum, concrete criteria for identifying sub-problems might annul the aforementioned history of modifying various aspects of the question. Neither will explicit mention of Molyneux's question demarcate the identity of replies. Thomas Reid never explicitly endorses his musings as being *about* Molyneux's question, though they clearly advocate both negative and affirmative answers to the question (Van Cleve 2007).³²

The plurality reply breaks up answers to Molyneux's question into separate domains of inquiry allowing a survey of several distinctive aspects: kinds of blindness, kinds of spatial form, tactile form recognition, effects of visual deprivation, immediacy of recognition, transfer, integration, and/or convergence of shape representation, the individuation of the senses, etc. If these distinctive aspects of the question are all given equal recognition, then each is an answer to the whole. For, an answer to Molyneux's question can include domain-specific integration of the kind of blindness of the subject pool, the kinds of spatial form used as stimuli, the paradigm that best determines whether tactile forms are indeed recognized, etc. and finally what counts as adequate visual form recognition or any single one of these sub-problems and their proper subsets as sufficient. In other words, the plurality answer to Molyneux's question suggests that future answers can be constituted out of diverse domains of study at multiple levels of explanation, and that perhaps there are even multiple processes involved at a single level of explanation in a single domain of inquiry. A plurality reply reflects the known complexity of the processes involved in both failing to see and seeing shape, and thus provides future prospects for this centuries-old question.

A range of further objections may emerge from the support of utilizing the cataract paradigm for answering Molyneux's question, from contesting the empirical correctness of the modified cataract experiment that attributes inefficacy to the cross-modal pathways,³³ to arguing that the cataract paradigm demonstrates

³² See also Grice (1962), whose reflection on possible alien senses and their individuation clearly applies to an answer to Molyneux's question, though is never explicitly applied.

³³ While this is not direct empirical evidence for affirming Molyneux's question, as real world visual and tactile experience is allowed in the interim between the first and second tests, it is suggestive that a more *direct* test might be administered that blindfolds subjects in the process of healing between testing, using novel stimuli in both occasions. This would generate data that is both empirically true and philosophically relevant, and likely in the affirmative given the initial data from the modified cataract paradigm.

the irrelevance of the philosophical issues once the focus of Molyneux's question.³⁴ I think these objections and others largely miss the point: philosophical problems are not to be solved and filed away like a math problem, but answered as a further step towards insight and understanding. The real intrigue of Molyneux's question is not the polarizing answers of "no" or "yes," but the philosophical and empirical productivity it generates.

Philosophers, too, should consider whether multiple yet equitable answers may be utilized in considering their problem sets—whether their problem of focus is constituted by a subset of disjunctively sufficient sub-problems. This paper may serve as a model for how to see the new life in other maturing philosophical problems that have taken on lives of their own.

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³⁴ Another way to put this objection is to say that Molyneux's question is really an empirical question and outside the scope of philosophical analysis. Still another way to make this point is to exploit the now common claim that 'software' is reducible to 'hardware,' wherein talk about the functionality of cross-modal concepts is really just talk of the functionality of cross-modal pathways.

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