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Abstract	Upon her release, Mary gains new knowledge aligned with B-type materialism and property dualism, even though she already possesses knowledge of all the facts and truths related to color and color vision during her time in captivity. I argue that this "cognitive progress" can only be accounted for by the acquisition of a new nonconceptual representation of the color red upon her release. Independently of any concepts, this acquisition already enables her to discriminate all sorts of shades of color within her environment. However, the existence of nonconceptual representations, by itself, is not enough to specify the type of knowledge Mary acquired, obviously. We must add two additional conditions. Firstly, the acquisition of these nonconceptual representations must enrich Mary's preexisting physical concept of red. Assuming that concepts are mental files, the enrichment takes the form of housing information in analog format, like pictures of the color red. Secondly, by utilizing these enhanced concepts by analog information, Mary can achieve an introspective propositional knowledge. She learns the truth of the crucial proposition: she learns what it is like to experience red.						
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1 ORIGINAL ARTICLE



2 Mary's cognitive progress

3 Roberto Horácio de Sá Pereira¹

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6 Abstract

Upon her release, Mary gains new knowledge aligned with B-type materialism and 7 property dualism, even though she already possesses knowledge of all the facts and 8 truths related to color and color vision during her time in captivity. I argue that this 9 "cognitive progress" can only be accounted for by the acquisition of a new non-10 conceptual representation of the color red upon her release. Independently of any 11 concepts, this acquisition already enables her to discriminate all sorts of shades of 12 color within her environment. However, the existence of nonconceptual representa-13 tions, by itself, is not enough to specify the type of knowledge Mary acquired, obvi-14 ously. We must add two additional conditions. Firstly, the acquisition of these non-15 conceptual representations must enrich Mary's preexisting physical concept of red. 16 Assuming that concepts are mental files, the enrichment takes the form of housing 17 information in analog format, like pictures of the color red. Secondly, by utilizing 18 these enhanced concepts by analog information, Mary can achieve an introspective 19 propositional knowledge. She learns the truth of the crucial proposition: she learns 20 what it is like to experience red. AQ1 21

22 Keywords Mary · Cognitive progress · Color

23 1 Introduction

After Mary emerges from the black-and-white chamber, her first encounter with a 4Q3 vibrant, ripe tomato gives her an immediate experience of the color red without her previous reliance on black-and-white monitors. Mary, a highly knowledgeable neuroscientist hailing from the future, knows all the facts about color and color perception (Jackson, 1982). Within the framework of physicalism, we tend to view this first sighting of the vibrant tomato as a catalyst for a tangible "cognitive advance" in

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A1Image: Constraint of the second second

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Mary's journey. This assumption leads us to ask how we can adequately understand and decode this significant step in her cognitive development.

The knowledge argument is often responded to by assuming that when Mary is 32 finally released, she acquires entirely new specialized phenomenal concepts that 33 relate to physical properties or facts that were already known to her through her ear-34 lier physical concepts during her captivity. This particular approach is commonly 35 known as the phenomenal concept strategy (PCS). However, because Mary's cogni-36 tive progress does not align with what Sainsbury and Tye refer to as a "discovery" 37 or "possibility-eliminating" scenario, her cognitive advancement can only take the 38 conventional form of recognizing established truths, such as realizing that Hesperus 39 is Phosphorus or that Cicero is Tully (see Sainsbury & Tye, 2012, p. 166). 40

Nonetheless, the PCS has faced noteworthy criticisms. Tye presents a notable 41 objection, asserting that the specific nature of phenomenal concepts required by the 42 PCS does not actually exist. In his works published in 2009 and 2012, Tye argues 43 that Mary's cognitive development should be explained in terms of "knowing about 44 things" rather than "knowing about truths." Challenging the underlying assumption 45 of Jackson's knowledge argument that Mary possesses only propositional knowl-46 edge, Tye proposes that Mary's cognitive progress entails acquiring knowledge by 47 acquaintance. 48

In his 2009 publication, Tye asserts that the key difference, the catalyst behind 49 Mary's cognitive enhancement, lies in the fact that she first becomes acquainted 50 with the color red that her new visual experience represents. While in prison, Mary 51 possesses factual knowledge regarding color and color vision. However, it is through 52 direct acquaintance that Mary acquires a singular piece of knowledge post-release. 53 I reject Tye's proposition. To summarize, the lacking aspect within the imprisoned 54 Mary's cognitive capacity is neither the absence of knowledge pertaining to a new 55 non-phenomenal fact (refuting anti-physicalism) nor the deficiency of a novel phe-56 nomenal concept (as proposed by the phenomenal concept strategy) nor a newfound 57 thing-knowledge through acquaintance. Instead, her deficiency is essentially non-58 conceptual: imprisoned, she is deprived of exercising her nonconceptual capacity of 59 discerning and distinguish shades of colors in the absence of nonconceptual repre-60 sentations. I must admit that this view, derived from common sense, resonates with 61 me to a significant extent. It does strike me as somewhat surprising that others had 62 not previously put forth such an idea. 63

In this paper, I present a new proposal that aims to resolve the mystery of Mary 64 in accordance with materialism/physicalism. According to the narrative, the impris-65 oned Mary possesses extensive knowledge of both the physics of color and the phys-66 iology of color vision. However, after her release, she gains new knowledge that 67 could prima facie be categorized as either type-B materialism or property dualism. I 68 argue that this cognitive progress can only be understood through her newly acquired 69 nonconceptual representation of the color red via her new visual experience. Inde-70 pendent of any concepts, this acquisition enables her to distinguish all possible 71 shades of color in her environment. Should I refer to this as B-materialism proper, 72 in the sense of Chalmers? At first glance, this seems inappropriate since we are not 73 dealing with two distinct concepts but rather one concept that is initially impover-74 ished (Mary imprisoned) and later enriched by a nonconceptual representation of 75

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the same property (Mary released). Nevertheless, the essential point is that we have two different perspectives on the same property: a conceptual third-person perspective and a nonconceptual first-person perspective. For lack of a better term, I will call this B'-materialism.

However, the existence of nonconceptual representations, by itself, is not enough 80 to specify the type of knowledge Mary acquired, obviously. We must add two addi-81 tional conditions. Firstly, the acquisition of these nonconceptual representations must 82 enrich Mary's preexisting physical concept of red. Assuming that concepts are men-83 tal files, the enrichment takes the form of housing information in analog format, like 84 pictures of red. Secondly, by utilizing these enhanced concepts by analog information 85 (pictures), Mary can achieve an introspective propositional knowledge. She learns the 86 truth of the crucial proposition: she learns what it is like to experience red.¹ 87

The structure of this article is organized as follows: The subsequent section pre-88 sents and endorses Tye's critique of the PCS (phenomenal concept strategy) while also 89 providing several caveats. The subsequent section examines Tye's recent proposal that 90 characterizes Mary's cognitive progress as a form of "thing-knowledge," offering an 91 analysis and assessment of Tye's proposition of 2009 and 2012. Tye is headed in the 92 right direction but is barking up the wrong tree. The penultimate section presents my 93 perspective as a resolution to Mary's conundrum (Tye, 2009, pp. 123-4). The paper 94 concludes with final remarks summarizing the key findings and contributions. 95

96 **2 The PCC**

97 Tye proposed a concise and coherent restructuring of the knowledge argument, 98 aligning it with Jackson's original narrative and facilitating a clearer understanding 99 of the recent critique of the PCS (phenomenal concept strategy). By adopting Tye's 100 approach, the analysis of the PCS becomes more accessible and understandable for 101 readers.

- Within the confines of her room, Mary possesses complete knowledge of all the physical facts pertaining to color vision.
- However, upon her departure from the room and upon encountering something red
 for the first time, Mary acquires a novel piece of information that was previously
 inaccessible to her within the confines of her room.

In her 2011 paper, Perez argues that "phenomenal concepts are complex concepts whose possession 1FL01 1FL02 conditions depend upon the mastery of many other concepts... And these later concepts have special 1FL03 possession conditions: they include the deployment of nonconceptual recognition capacities" (2011, p. 1FL04 113). However, this is not my view, and I totally reject it. First, following Tye (2009) and Ball (2009), I 1FL.05 1FL06 reject the very idea of phenomenal concepts, i.e., special concepts that could only be acquired based on 1FL07 experiences and introspection. Second, my claim is that there is only one concept involved: the concept 1FL08 of the color red that imprisoned Mary already possesses. What happens? Like a mental file, Mary's old 1FL09 physical concept of red is enriched by the acquisition of a new nonconceptual representation of the color 1FL010 red through her new visual experience of red. This newly acquired nonconceptual representation of red is

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3) Therefore, it can be deduced that subsequent to Mary's departure from her room,she learns a nonphysical fact.

4) Therefore, through this line of reasoning, it is implied that the hypothesis ofphysicalism is rendered false.

Physicalists are faced with the necessity of dismissing the conclusion of the 111 knowledge argument (the fourth point presented). In response to the knowledge 112 argument, physicalists have traditionally adopted two distinct approaches. The ini-113 tial reaction involves challenging the central assertion that Mary makes some cog-114 nitive improvement, achieved by disputing premise 2. This perspective finds sup-115 port from scholars such as Dennett (1991), Dretske (1995), and others. According 116 to this viewpoint, no fundamental ontological gaps are separating physical and phe-117 nomenal properties because upon her release, Mary does not undergo any cognitive 118 advancement with regard to the nature of experiencing the color red. This particular 119 response to the knowledge argument is what Chalmers terms "type-A materialism." 120

The alternative viewpoint operates under the assumption that Mary indeed undergoes cognitive development following her encounter with a ripe tomato. Dubbed type-B materialism by Chalmers, proponents of this approach challenge conclusion 4 of the argument, claiming that it does not follow from 1 and 2 that there are nonphysical facts about the phenomenal red. One prevalent iteration of this stance is type-B materialism, which suggests that Mary's cognitive advancement can be elucidated by proposing that she acquire new, distinctive, phenomenal concepts.

The underlying framework of the PCS can be concisely outlined as follows. 128 Advocates of the PCS assert that phenomenal concepts possess a distinct nature. 129 They go beyond typical concepts used introspectively; instead, they hold a unique 130 status since they can only be acquired through undergoing a specific experience and 131 deliberately focusing on the phenomenal character of that precise experience. The 132 PCS serves two primary purposes. Firstly, it aims to account for an epistemic gap 133 between physical and phenomenal properties. Specifically, it seeks to elucidate why 134 we cannot deduce phenomenal truths from physical and indexical truths a priori. 135 Rather, this deduction must necessarily be a posteriori arising from the experience 136 of red and its inherent phenomenal character. By addressing the subjective nature of 137 her initial encounter with red, Mary attains a newfound, phenomenal concept that 138 pertains to the nature of experiencing redness. 139

The second accomplishment brought about by the PCS is the endeavor to bridge the metaphysical and ontological divide between the phenomenal and physical properties themselves. By encompassing a physical property within a newly acquired phenomenal concept, such as the understanding of "what it is like to experience red," Mary's cognitive progress does not entail an inherent dichotomy between the physical and phenomenal domains. Instead, it demonstrates that phenomenal and physical properties are the same.

The PCS encounters at least two significant challenges that warrant attention. Firstly, according to the PCS framework, Mary acquires a new, special, phenomenal concept concerned with the subjective dimension of experiencing red by focusing on her fresh encounter with the phenomenon. But a question arises when considering the assumption that Mary possesses exhaustive knowledge of all physical

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facts pertaining to color and color vision. If we adhere to physicalism, it becomes conceptually challenging to understand how Mary could make a real discovery, that is, acquiring novel information by the acquisition of her new phenomenal concepts relating to the subjective nature of experiencing red—information that was not already within her possession during her period of confinement.

At first glance, the most promising idea is to consider phenomenal concepts as 157 indexical demonstrative concepts. To my knowledge, John Perry was the first to pro-158 pose this idea (Perry, 2000, p. 146). He suggests that when we introspectively focus 159 on the phenomenal aspect of our sensory experiences and want to convey what it is 160 like to be in that specific mental state, we use what he calls a "flexible demonstra-161 tive," such as "this1." Nonetheless, one does not need to adhere to Wittgenstein's 162 light behaviorism to be intrigued by Perry's use of "flexible demonstratives" in the 163 introspective knowledge of phenomenal character. For example, if I do not know 164 whether the phenomenal character of my sensory experience now has anything to do 165 with whatever happens outside me, how could I know that the "what it is like" for 166 me now has anything to do with the "what it is like" for me in the past? 167

Be that as it may, in his original account of phenomenal concepts, Papineau 168 (2002) also claims that our brains are wired to form copies or replicas of the experi-169 ences we undergo, and these replicas play a crucial role in fixing the reference of 170 phenomenal concepts. To form a phenomenal concept of an experience, we must 171 be able to focus on it when we experience it introspectively and recreate it imagina-172 tively at other times. Phenomenal concepts are mental demonstratives that enable us 173 to form terms structured as "the experience:—" where the gap is filled either by a 174 current token experience or by an imaginative recreation of an experience. Exercis-175 ing phenomenal concepts involves recreating, simulating, and thinking of a phenom-176 enal state or experience in introspection or memory. To this, Tye replies: 177

One worry for this line of reasoning is that if the mode of presentation the 178 demonstrative concept supposedly uses is held to consist in properties Mary 179 a priori associates with the referent, then Mary will only be in a position to 180 make a genuine discovery if the properties she associates with the experience 181 of red upon her release, as she conceives of it demonstratively, are properties 182 she did not already associate with it in her room. But if she really does have 183 exhaustive knowledge of all the physical facts (past, present, and future), then 184 the only way Mary can associate new properties with the experience of red is 185 if those properties are non-physical. (see Tye, 2009, pp. 127-128). 186

The second main objection arises from the idea that concepts have a "deferential" nature. According to Tyler Burge' famous stance, natural kind concepts are inherently deferential. He presents a hypothetical case involving a patient who mistakenly believes and complaints to her doctor that she has arthritis in her thigh. The orthopedist corrects her, explaining that "arthritis" refers only to conditions affecting the joints. This demonstrates that users of natural kind concepts defer to the expertise's use established by experts within a community (Burge, 1979, pp. 77-79).

The assumption is that we can possess these concepts even if our understanding of them remains partial. Tye claims that while a comprehensive grasp of a general phenomenal concept may necessitate prior experiential engagement, possession of

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such concepts, akin to most other concepts, does not mandate complete understand-197 ing. Tye claims that when Mary sees a ripe tomato for the first time, her comprehen-198 sion of the color red advances, suggesting the development of her newfound visual 199 faculty to discern redness. Contrary to Burge (1979), the concept of "red" is defer-200 ential and can be possessed even in a state of partial understanding. Notably, even 201 blind people lacking visual perception possess the concept of "red" to the extent 202 that they can combine and recombine it with various singular concepts they possess, 203 such as acknowledging that red is the color of ripe tomatoes and apples. Tye further 204 extends this line of reasoning to apply to phenomenal concepts as well (see Tye, 205 2009, p. 64). 206

But "then render to Caesar the things that are Caesar's; and to God the things that are God's" (Matthew 22:21, NASB). In this context, we render to Tye what is Tye's (certainly a great tutor of Ball) but to Derik Ball the things that are Ball's! That being said, Ball invites us to consider the following scenario. Imagine a case where "being in pain" is not even a phrase in ordinary English (see Ball, 2009, p.16). Now, consider an analog of Mary, who has never experienced pain. Mary could come to have beliefs she would express with sentences like "Q is painful!"

I strongly align myself with Ball's assertion concerning the deferential nature of 214 nonnatural kind concepts. This claim entails individuals utilizing concepts such as 215 red must remain receptive to the possibility of being corrected regarding whether a 216 particular shade legitimately qualifies as red, considering the input of an authorita-217 tive source. Similarly, I fully endorse Tye's contention that phenomenal concepts 218 also exhibit this deferential quality. Similarly, individuals employing such concepts 219 must be willing to embrace potential corrections regarding the presence of the phe-220 nomenality associated with their ongoing experiences, as exemplified by the concept 221 of "phenomenal red." They should be open to recognizing that their current experi-222 ence may require adjustments in light of expert assessments as to whether it genu-223 inely embodies the phenomenal quality associated with experiences of the color red. 224

However, when examined as a counterargument against advocates of the PCS, 225 Tye's line of reasoning appears to engage in the logical fallacy of begging the ques-226 tion. Tye's argument relies on the concept of the "transparency of experience" 227 without providing a substantive argument to support it. This concept is articulated 228 by Tye as follows: "Once it is acknowledged that visual experience is transparent, 229 there is reason to hold that the phenomenal character of the experience as red can-230 not be conceptually separated from the color red itself" (Tye, 2009, p. 64). Tye and 231 Ball assume, without substantial justification, the transparent nature of experience, AQ5 232 wherein the same concept of red is used to denote both the physical property that the 233 experience represents and the phenomenal aspects of the experience. This implicit 234 assumption leads to the conclusion that there is nothing inherently unique about 235 phenomenal concepts, suggesting that individuals like Mary could conceivably pos-236 sess these concepts, albeit under somewhat tenuous circumstances, even while con-237 fined within a black-and-white room. However, it is precisely this very issue that is 238 being disputed and forms the crux of contention in this debate. 239

One potential strategy to address the problem posed by Tye is as follows: Consider an individual utilizing their phenomenal concept, such as the concept of "phenomenal red," to refer to different instances of their experiences of red in various

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contexts. The crucial question that arises is as follows: How can Tye and Ball justify their implicit assertion that they consistently employ the same phenomenal concept across these instances, assuming that all their individual experiences represent instances of the same type of red sharing a common phenomenal quality referred to as "phenomenal red?"

Suppose the person mistakenly identifies two or more experiences as being of the 248 same shade or, in more extreme cases, as being experiences of red when, in reality, 249 one of them is a visually experience of a different hue, such as orange. In such situa-250 tions, only an expert, possessing complete understanding akin to "omniscient Mary" 251 herself, who can scrutinize the person's visual cortex, would be able to resolve these 252 uncertainties definitively. This resolution would highlight the limitations of the per-253 son's competence in comparison to the expertise of a neuroscientist. Therefore, even 254 if we grant the person a certain level of authority regarding the phenomenal charac-255 ter of their experiences, they would still need to defer to an expert when ambigui-256 ties or doubts arise. This argument underscores the contention that there is nothing 257 inherently distinctive about the nature of phenomenal concepts. 258

259 **3 Acquaintance**

Suppose that the conventional strategy of the PCS proves inadequate in explaining Mary's cognitive advancement, as there are no phenomenal concepts that fulfill the necessary criteria. Alternatively, the so-called internal physical state view proposes a form of introspective knowledge achieved through acquaintance with the specific phenomenal nature of experience.

Balog (2012) has also advanced a mixed account, combining PCS with the traditional idea of knowledge by an acquaintance. The reference and significance of these phenomenal concepts are grounded in the introspective knowledge and acquaintance with one's mental states and their corresponding phenomenal character. The idea is that acquaintance with the phenomenal character of sensory states is an indispensable condition for acquiring phenomenal concepts (see Balog, 2012, p. 1).

In contrast, Tye proposes an alternative view, suggesting that Mary's cognitive progress is not attributable to introspective knowledge acquired through acquaintance with the phenomenal red. Instead, Tye posits that her progress stems from becoming acquainted with the color red, as represented by a ripe tomato in her visual experience (see Tye, 2009, p. 96; 2012). Tye argues against Jackson's knowledge argument, highlighting its reliance on the mistaken assumption that all of Mary's prior knowledge is propositional (see Tye, 2009, p. 131).

It is widely recognized that there is no consensus when it comes to understand-278 ing the acquaintance relationship. In 1912, Russell attempted to clarify this issue by 279 defining it as a direct cognitive connection to the object itself, where one is imme-280 diately aware of the object (as described in Russell's work, 1912, p. 108). Russell's 281 interpretation distinguishes between knowledge acquired through acquaintance 282 and knowledge of truths, also known as propositional knowledge. *Knowledge* by 283 acquaintance is defined as a type of objective knowledge as opposed to knowledge of 284 truths or propositions, typically propositional attitudes. Acquaintance is considered 285

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to be a simpler form of knowledge, prior to and logically independent of knowledgeacquired through descriptions or propositional knowledge of truths.

If we were to adopt an epistemic definition of acquaintance, understanding it 288 as direct contact with an entity, it would assume the status of a primitive concept 289 that eludes further explication. The nature of such a primitive acquaintance could 290 be argued to be entirely mysterious. Thus, if we assert that Mary came to possess 291 knowledge of the red that constituted her novel experience upon her release, it raises 292 the question of what this assertion truly implies. Russell's formulation of knowledge 293 by acquaintance, characterized by an "immediate consciousness," indeed suggests a 294 form of perceptual relation, an interpretation that some philosophers have embraced. 295 Tye is counted among those who interpret acquaintance in this manner. For Tye, 296 acquaintance must be conceived as the direct perceptual contact with the objects 297 that are being experienced. I am acquainted with a given entity if my conscious state 298 enables me to ask, "What is that?" with respect to that entity (see Tye, 2009, p. 100). 299 Tye argues that it is through having such "de re" mental states that the representation 300 gains access to the "global workspace," located primarily in the frontal lobe, render-301 ing it conscious. In other words, the formation of a "de re" mental state allows the 302 representation to enter the neural processes responsible for conscious, known as the 303 "global workspace." 304

Let us now critically examine the current context under discussion. The initial 305 inquiry that emerges from Tye's account raises concerns about the consistency of 306 his or Russell's distinction between "thing-knowledge" and "fact-knowledge," par-307 ticularly when applied to material objects rather than sense data. For instance, con-308 sidering the example of being acquainted with the city of Athens, it becomes appar-309 ent that such acquaintance entails possessing a wealth of factual knowledge about 310 Athens itself. This substantial knowledge would encompass a range of truths and 311 facts concerning Athens, including its designation as the capital of Greece, its sig-312 nificant historical role as the birthplace of philosophy, and the presence of renowned 313 philosophers such as Plato and Aristotle during its classical era, among others. 314 Similar arguments can be extended to the city of Istanbul and an Apple computer. 315 These considerations provoke an important question: Does the acquisition of "thing-316 knowledge" through acquaintance with material objects not inherently rely on the 317 possession of propositional knowledge encompassing the truths associated with the 318 particular material object under consideration? 319

Tye's examples, namely Athens and Apple, introduce a degree of ambiguity and may unintentionally imply the constant involvement of propositional knowledge. However, it is important to note that there is no inherent inconsistency in distinguishing between "thing-knowledge" and propositional knowledge. *What I mean is that one can indeed have a thing-knowledge without having any propositional knowledge* and vice versa: we can have lot of propositional knowledge without any kind of thing-knowledge.

It is quite easy to illustrate that we can have propositional knowledge (knowledge of truths) without knowledge by acquaintance (thing-knowledge). For instance, I know that Napoleon lost the famous battle of Waterloo. The British defeated him. How do I know that truth? Well, overwhelming historical evidence supports the claim that Napoleon lost this battle. Since I was not even born yet and have

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never been to Waterloo, I could not have known this by acquaintance. Similarly,
I know that Caesar crossed the Rubicon. Again, how could I have known this by
acquaintance?

But it is also easy to illustrate that one can have knowledge by acquaintance 335 (thing-knowledge). For about a year, after exhausting lessons, I returned to my 336 house, opened a bottle of wine, and listened to Beethoven's Seventh Symphony 337 almost every day. While I listened, I often saw a little mouse crossing my living 338 room, which I never managed to catch. No doubt, the mouse, like me, possessed 339 knowledge of Beethoven's Seventh Symphony by acquaintance (thing-knowl-340 edge) from hearing it frequently. I even started to wonder if the mouse enjoyed the 341 symphony because it always appeared when I was listening to it! I am not sure if 342 mice have the kind of propositional knowledge or propositional attitudes (beliefs, 343 thoughts, etc.) that humans and primates do. However, I am certain that the little 344 mouse did not know any facts or truths about the symphony. No evidence supports 345 the claim that the mouse knew that it was listening to a piece of music, a symphony, 346 or Beethoven's Seventh Symphony. 347

According to Tye (2009, p. 136), knowledge by acquaintance is a form of knowl-348 edge that is nonconceptual and nonpropositional by nature. However, if we accept 349 Tye's account as it is, then it can be argued that the fundamental difference in Mary's 350 case is not primarily between "thing-knowledge" and "fact-knowledge" but instead 351 between the nonconceptual nature of sensory experience and the conceptual nature 352 of thoughts, as well as between the nonpropositional nature of the content of sensory 353 experience and the propositional nature of the contents associated with our propo-354 sitional attitudes. In other words, the main distinction lies in the difference between 355 perception and cognition. 356

However, in order to substantiate our position, we require further argumentation. 357 Let us concede with Tye's proposition that Mary while being held captive could 358 potentially possess a demonstrative understanding of the experience of perceiving 359 the color red through a cerebroscope. Consequently, it is necessary to agree that 360 during her captivity, she already possesses "thing-knowledge" through her direct 361 acquaintance with the phenomenal character of someone's visual experience of 362 red. Naturally, acquiring an understanding of the phenomenal red does not neces-363 sarily involve having a demonstrative concept of this specific color. However, hav-364 ing a demonstrative concept of this particular shade of red does necessitate direct 365 acquaintance with the red itself. 366

Therefore, when you direct the cerebroscope towards an image of the brain, Mary 367 might inquire, "What is that?" It must be assumed that she possesses a conscious-368 ness that is directly associated with the experience of the phenomenal red. Conse-369 quently, Tye faces a dilemma: either he abandons his earlier claim that Mary might 370 already possess a demonstrative concept of the phenomenal red in her captivity 371 because a demonstrative concept presupposes acquaintance with phenomenal red or 372 he must abandon his claim that acquaintance with the phenomenal red makes the 373 difference. 374

An objection may arise in defense of Tye's position, suggesting that Mary's acquaintance with a brain pattern via a cerebroscope does not align with Tye's specific technical definition of acquaintanceship. The argument contends that the

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cerebroscope serves as an intermediary, facilitating Mary's interaction with the phenomenal red while she remains in captivity. Depending on one's interpretation of the
ambiguous concept of knowledge by acquaintance, this argument could conceivably
hold merit.

However, the objection fails to grasp the crux of the matter. When Mary finds herself confined, her visual perception is directed towards the instantiation of a neural property P (a neural pattern). At that precise moment, she may not have any knowledge of any truth about what she is observing. Indeed, she may even wonder, what, after all, is P (what she is seeing)? Therefore, Mary possesses a form of knowledge by acquaintance directly related to the observed entity in question.

It is my belief that these concise arguments elucidate the fact that the underlying 388 essence of Mary's puzzle does not lie in invoking the Russellian dichotomy between 389 knowledge of truths or facts and "thing-knowledge" attained through acquaintance-390 ship. Mary's deficiency does not stem from a lack of "thing-knowledge" regarding 391 the phenomenon of redness, which she had not previously encountered. Rather, her 392 inadequacy manifests in her incapacity to nonconceptually discriminate shades of 393 colors in her perceptual environment. Tye's line of reasoning is heading in the right 394 direction, albeit pursuing an inconsequential aspect of the matter. 395

396 4 Fred and Mary

Jackson has made a crucial distinction between the cases of Mary and Fred, a dis-397 tinction that seems to have eluded others. Fred, possessing heightened color vision, 398 stands in stark contrast to Mary, a highly skilled neuroscientist. To further aug-399 ment this distinction, let us introduce an additional supposition: in addition to his 400 exceptional color perception, Fred wrestles with a significant cognitive impairment 401 that impacts his long-term memory, especially pertaining to colors. Despite earnest 402 efforts, he struggles with the inability to recollect iconic shades such as Ferrari red. 403 On the other hand, Mary, possessing all-encompassing knowledge and a deep under-404 standing of colors, faces a unique challenge in her perceptual experience-she can-405 not visually differentiate the color red from other hues. This deficiency is character-406 ized by the absence of a nonconceptual representation of colors in her confinement. 407

Despite Fred's cognitive limitations that hinder his ability to form even a demon-408 strative concept of the color red and grasp the subjective nature of his experience, 409 he surpasses others in his remarkable ability to discriminate a specific shade of red 410 and single it out from its surrounding context. This ability is attributed to his non-411 conceptual discriminatory perceptual capacities. It is noteworthy that Fred lacks 412 the minimal conceptual representation of the color red yet exhibits an extraordinary 413 nonconceptual capacity to discriminate this particular shade with unparalleled preci-414 sion. In stark contrast to Mary's comprehensive knowledge and conceptual under-415 standing of color, Fred's situation, as exemplified in Jackson's argument, highlights 416 the fundamental dichotomy between conceptual and nonconceptual discriminatory 417 abilities pertaining to the same color-red. Fred's exceptional but conceptually defi-418 cient proficiency serves to emphasize that this distinction takes precedence over the 419 dichotomy between "thing-knowledge" and propositional knowledge of facts. 420

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In order to demonstrate that Mary's cognitive improvement can be elucidated 421 through her nonconceptual discriminatory abilities, it is proposed to adopt Dret-422 ske's perspective, especially with regard to his proposition on the naturalization of 423 experiential content. At the core of Dretske's project lies the concept of information, 424 approached technically (see Dretske, 1981; 1988; 1995). According to this frame-425 work, a signal, which is represented by a neuronal state, carries information about 426 a source, which refers to the property instantiated by an external object. The infor-427 mational relationship between the signal and the source is characterized by a nomic 428 covariation, whereby the presence of the signal is contingent upon the presence of 429 the source. In more precise terms, Dretske's framework posits that a signal conveys 430 information about a source when there exists a nomic covariation between them. 431 This covariation is such that it supports the counterfactual proposition that the signal 432 would not occur without the simultaneous occurrence of the source. In probabilistic 433 terms, given the instantiation of the source, the probability of the signal occurring is 434 stipulated to be 1 (see Dretske, 1981, pp.1-53). 435

The transmission of information can manifest in two distinct forms: analog and 436 digital coding. Analog coding entails the transmission of information through a 437 signal that not only carries some specific information but also incorporates addi-438 tional data alongside it. On the other hand, digital coding employs a signal that 439 transmits the information in a manner devoid of supplemental content (see Dretske, 440 1981, p.135). To illustrate this distinction, consider the transmission of information 441 regarding the color red of an object. Analog coding occurs when the information is 442 conveyed through a signal, such as a neural state, which not only provides details 443 concerning the redness of the object but also specifies the precise shade of red. In 444 contrast, digital coding of information pertaining to the color red ensues when the 445 signal solely imparts the information that the object possesses a red hue without 446 offering any accompanying details. 447

In 1995. Dretske re-elaborated the distinction between analog and digital coding 448 by delineating it in terms of the distinction between systemic representation, coded 449 in analog form, and acquired representation, coded in digital form. Systemic repre-450 sentations, owing to their systematic relationships with other states within the same 451 system, comprise states that convey specific information about a given entity. To 452 exemplify this concept, one can consider an analog thermometer-a system in a par-453 ticular state, such as the mercury positioned at a designated level, which imparts 454 information about the temperature. Within this systemic framework, a state denoted 455 as β, for instance, may systematically represent 32 °C. Notably, even slight fluctua-456 tions in the mercury column, either upwards or downwards, convey something dis-457 tinct from the value of 32 °C (see Dretske, 1995, p. 12). 458

In contrast, acquired representation operates within a digital paradigm. A state may represent something not by virtue of its systemic relations within the same system but rather by being recognized as a token of a particular type. For instance, in the context of a digital thermometer, irrespective of the specific systemic representation of state β , it might be deemed to represent 38 °C as a token of a specific type, alongside other states denoted as β' , β'' , and β''' , all assessed as tokens of the same type (see Dretske, 1995, pp. 13-14).

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The concept of representational content cannot be adequately explained solely by 466 considering the registration of information, as it fails to incorporate the possibility of 467 misrepresentation within this technical framework. Accordingly, Dretske argues that 468 true representation emerges in contexts where the possibility of misrepresentation 469 exists. To address this, Dretske introduces teleology into his framework. Accord-470 ing to Dretske, representational content is established when a sign not only conveys 471 information about a source but also acquires the purpose or function of indicating 472 that specific source. This function, termed the "indicator function" in Dretske's ter-473 minology, is crucial (see Dretske, 1995, p. 4). It is the teleological aspect-the func-474 tion of indicating a particular source-which imparts representational content to the 475 sign, surpassing the mere registration of information. 476

The core of the matter resides in the differentiation between sensory represen-477 tations characterized by nonconceptual nature and those infused with conceptual 478 content. Within the realm of nonconceptual sensory representations, brain states 479 have evolved with a specific purpose as indicators. This evolutionary adaptation has 480 facilitated the species' ability to adapt to its environment. To illustrate this, let us 481 consider a neuronal state in the visual cortex that changes whenever the color red 482 is perceived, thereby informing the individual of the presence of that particular vis-483 ual token. The underlying rationale for such mechanisms stems from the vital role 484 played by the ability to discriminate the color red from other hues in the species' 485 adaptation to its surroundings. It is postulated that neuronal states carrying infor-486 mation about the presence of the red token have been recruited phylogenetically 487 through the process of natural selection, aligning with the imperative to indicate 488 or represent that specific instance of red-a crucial adaptation for the survival and 489 thriving of the species within its environment. 490

Within the domain of conceptual representations, the trajectory of the indicator 491 function takes a distinct path—it is acquired through the process of learning. To 492 be able to conceptualize and represent the color red, for instance, subsequent brain 493 states must acquire an additional indicator function through the process of learning. 494 This newly acquired function is directed towards representing various instances of 495 red as manifestations of a broader categorical concept. Conceptual representations 496 typically build upon preceding nonconceptual representations. Dretske character-497 ized this transformation as a transcoding process in which the available information 498 undergoes a conversion into digital form. In this process, all information pertaining 499 to diverse instances of red is transcoded into information that represents the same 500 conceptual type of red. This transition from nonconceptual to conceptual represen-501 tation constitutes a nuanced progression that involves the development of specific 502 indicator functions through learning experiences. 503

Returning to Jackson's paper, Dretske's differentiation between nonconceptual 504 systemic representations and acquired conceptual representations appears to accu-505 rately capture the distinction between Mary's and Fred's situations. Upon examining 506 Fred's condition, his exceptional color vision grants him the ability to surpass others 507 in discriminating not only the color red from other hues but also an extensive range 508 of red shades. However, Fred's inability to retain any information in his memory 509 prevents him from regarding any state of his brain as a token of the conceptual cat-510 egory of red. Shifting focus to Mary, despite her profound knowledge of color and 511

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color vision, which encompasses a wide array of conceptual understanding, she is
still capable of attaining new insights regarding the phenomenal aspect of redness.
Upon her release, Mary acquires a nonconceptual representation of red and subsequently integrates it into her preexisting conceptual framework. By doing so, she can
leverage her established concept of red to articulate her newfound understanding.

One might wonder how Mary enriches her old concept by integrating into it the 517 newly acquired nonconceptual representation of red. My proposal is this: We can 518 consider concepts as mental files, similar to the way Recanati (2012) proposes. Like 519 a mental file, Mary's old concept of red houses exhaustive information about the 520 color and the physiology of the phenomenal red, coded in the digital format typical 521 of conceptual and propositional knowledge. What does that old concept or mental 522 file lack? The answer is information conveyed in the traditional analog format, stem-523 ming from her new visual experience of the red color of a ripe tomato. Usually, 524 information coded in an analog format takes the form of a picture of the object or 525 the property in question. With that in mind, upon her release, Mary's old mental file 526 of the color red and the phenomenal red enriches by housing some pictures of the 527 color red in the way that Papineau suggests (2002). It is that old mental file, now 528 enriched by pictures of red, which explains Mary's cognitive progress, enabling her 529 to pick out the phenomenal red introspectively and at the same time to discriminate 530 red from other colors visually. 531

Finally, it may be asked to what extent my account differs from the so-called ability hypothesis of Laurence Nemirow and David Lewis. The "ability hypothesis," as Lewis puts it, suggests that "knowing what an experience is like is simply the possession of abilities to remember, imagine, and recognize. *It's not knowing-that, it's knowing-how*" (Lewis, 1990, p. 516, emphasis added). Similarly, Nemirow suggests that "knowing what an experience is like is essentially the same as *knowing how to imagine having that experience*"" (Nemirow, 1990, p. 495, emphasis added).

However, I am not suggesting that Mary's improvement is a simple acquisition of a new *know-how* without propositional knowledge. On the contrary, I assume that Mary makes a cognitive improvement. By acquiring a new nonconceptual representation of the color red, combined with her old concept of red housed in a single mental file, Mary learns the truth of the crucial proposition: she learns what it is like to experience red.

Dretske's distinction elegantly navigates the complexities of both the epistemic 545 and ontological gaps within the context of Mary's situation. During Mary's captiv-546 ity, her knowledge remains confined to conceptual representations-information 547 encoded in digital form about the color red. However, upon her release, she gains 548 access to new representations of the same phenomena in a nonconceptual manner, 549 encoded in analog form. This transition effectively bridges the ontological gap, 550 revealing that there exists no metaphysical divide between the physical and phenom-551 enal domains. Rather, it highlights different modes of representing the underlying 552 reality. 553

Nonetheless, an epistemological gap persists as Mary is unable to deduce a priori information encoded in analog form from information encoded in digital form. This limitation stems from the inherent nature of deduction, which operates within the realm of propositions containing concepts. The attempt to infer experiences,

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characterized by nonconceptual representations, solely from concepts themselves
appears conceptually unviable. This distinction sheds light on the intricate interplay
between modes of representation and the inherent limitations of epistemic inference.

561 **5 Concluding remarks**

In conclusion, I assert the superiority of my account over its competing theories. 562 presenting a compelling argument, particularly in the context of inference to the best 563 explanation. The journey of Mary, encompassing her preexisting concepts and her 564 newly acquired nonconceptual representations of red, emphasizes a crucial tenet: 565 she indeed represents the same reality through distinct perceptivities. This pivotal 566 realization resonates with the core of my account, affirming that the phenomenal 567 and physical realms are not inherently incompatible but rather encompass different 568 aspects of representing the underlying reality. By elucidating this convergence, my 569 account remains resilient in the face of challenges posed by anti-physicalist perspec-570 tives, providing a more comprehensive and integrative explanation of the intricate 571 relationship between the physical and phenomenal dimensions of human experience. 572

In addressing the challenges posed by the PCS, my account endorses Tye's view, 573 albeit by different means. However, the strength of my account lies in recognizing 574 the fundamental distinction between nonconceptual representations, which form 575 an integral part of the framework, and concepts themselves. Importantly, it would 576 defy logical coherence to posit the acquisition of these nonconceptual representa-577 tions without the medium of actual experiential engagement. Therefore, my account 578 adeptly navigates through the complexities of the PCS, illustrating that the unique 579 nature of nonconceptual representations aligns with the inherent connection between 580 acquiring such representations and the lived experiences in which they originate. 581 The smooth integration of conceptual and nonconceptual elements in the mental file 582 framework exemplifies Mary's cognitive progress. 583

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