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Concepts as soft detectors.

1. There is a popular way of thinking about perception which makes it seemingly impossible to reconcile with anti-representationalism. In short it can be presented like this:

   (1) Some properties can only be perceived indirectly with the aid of concepts.
   (2) Even basic cognitive systems have such indirect perceptions
   (3) Concepts are representations
   (4) Thus, anti-representationalism is an untenable position.

The third premise is typically assumed without argumentation (for an example of this see (Machery, 2011, p. 222)) and even anti-representationalists seem to accept it (Hutto & Myin, 2013, p. 31). Thus, it seems that the best way to escape (4) is to challenge premises (1) or (2). The easiest way out of trouble seems to be to deny (1) completely, that is to say, that no perceptions have necessary conceptual input. But this is a solution which may be thought to be too extreme even by those who believe that perception contains non-conceptual content.\(^1\) The idea that concepts play a significant role in at least some perceptions is definitely quite old and can be traced back at least to Descartes. In a famous passage he realizes that a piece of wax he looks at isn't literally “seen” because what can be literally seen is a set of simple properties and not a complex property like “being a piece of wax”. The passage ends with a simpler and even more persuasive argument. Descartes notices that saying that he “sees” people on the street is somewhat risky as they might just as well have been automatons dressed as people (Descartes, 1996, p. 21). Again – the property of “being human” isn't something you can observe with a naked eye, you need the help of your mind's eye, or at least that's how the story goes.

The intuition expressed in (1) is widespread but everybody seems to differ as to where to draw the line. For example Galen Strawson describes seeing as if deploying concepts in perception was a standard procedure (G. Strawson, 1994, p. 4). This line of thinking goes back to the attack on the myth of the given by Wilfrid Sellars (Sellars, 1956) and seems to be still popular today (Goff, 2012). Some researchers resort to notions of generality or abstractness (Block, 2008, p. 307, Grush, 2007, p .504) – as if you were supposed to be able to see without concepts as long as the term referring to the object you see wasn't abstract or very general. For example, Dretske argues that you don't have to know that something is an armadillo (and thus use the concept of armadillo) to see the armadillo on the road but he is not so sure about the possibility of seeing the armadillo on the road without knowing that it is an animal (and thus having the concept of animal) (Dretske, 2002). Sometimes generality and abstractness are invoked directly (see (Murphy & Medin, 1985) or (Gelman & Markman, 1986)), sometimes they are implied in examples or experiments (Mandler, 2003). Some researchers seem to think that concepts enter the picture when the observer displays the ability to perceive second order properties (Wasserman, 2002), kind properties (Siegel, 2006) or causal properties (P. Strawson, 1985), (Taylor, Hunt, Medina, & Gray, 2009). In the spirit of British empiricists and early positivists

\(^1\) For a good rundown on non-conceptual position see Crane's introduction to (Crane, 1992), for a more nuanced view see (Crane, 2009).
perceivable properties are oftentimes divided into simple and complex and seeing the latter is supposed to involve concepts. But the division is typically either vague or seems highly arbitrary (Armstrong, 1993, p. 235). Let’s call this inability to settle on where the boundary between simple and complex perceptions is “the Division Problem”.

The Division Problem is even more emphasized when we move towards the premise (2). You don’t have to go very far – it is enough to turn to descriptions of perception in non-human animals and infants. Consider a following simple argument:

A dog sees the postman
The postman is the best chess player in the city
Thus, the dog sees the best chess player in the city.

Needless to say the argument is formally valid but you may refrain from accepting the consequence. You might say that the conclusion is just a shortcut for something like: “it sees the postman we know to be the best chess player in the city” because to see the best chess player in the city implies among others having the concept of chess. But then again – doesn’t seeing the postman imply having a bunch of concepts that are probably too complicated for a dog to grasp, like a concept of a letter or a post office? So maybe the only thing the dog can see is a man dressed in a particular way? But than again – what exactly do dogs know about dressing? In fact, as I argued elsewhere [xxx], once you go this route you might find yourself questioning animals’ ability to see any objects at all (as opposed to seeing properties or events). The less complicated cognitive system you choose, the more aggravating the problem gets. Even if you wished to bite the bullet and decided that dogs do have the concept of chess you might start to hesitate if we switched dogs to fish, insects or simple artificial systems. In other words, even if indirect, concept driven perceptions exist, we have no clue as to how widespread they are. Let’s call this problem “the Distribution Problem”.

The Division Problem and the Distribution Problem shouldn’t be confused with each other. As indicated in (1) and (2) they are obviously connected but nonetheless distinct. For example - it could have turned out that the solution for the first problem gives us the tools to differentiate between direct and indirect perception but only in the case of complex cognitive systems. For example - it might turn out that the solution depends somehow on verbal reports of the observer. Alternatively it may turn out that indirect perception is possible only in the case of complex systems (which solves the Distribution Problem) but that we are still not able to differentiate between direct and indirect perception (and are unable to solve the Division Problem).

To deal with the problem presented in (1)-(4) I plan to resort to a following strategy: I will retain premises (1) and (2) but reject (3) by presenting an account of perception which involves concepts but explains them in a non-representational way. Additionally, as I want to keep (1) I will try to eliminate the vagueness that plagues it and give a precise answer as to which perceptions need the conceptual component, that is propose a solution to the Division Problem. As we will see the solution to the Distribution Problem will then follow naturally.

Note that the Division Problem differs from the so called “cognitive penetrability” question. Those interested in the penetrability question ask if higher cognitive capabilities (and using concepts is one of the paradigmatic examples of higher cognitive capabilities) can interact with lower cognitive capabilities (perception amongst them). There are two distinct question to be asked – we may ask about

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2 The reason for this is that at least some uses of the verb “to see” create intensional context (Anscombe, 1965). I do not discuss this problem in this paper but see [xxx] for a possible extensional explication of the term “to see”.

bottom-up and top-bottom penetrability. In case of perception the bottom-up question is rather trivial – it is obvious that perception affects our concepts. It is the top-bottom question that is similar to our problem but the difference lies in modality. Note that premise (1) does not state that concepts can affect perception but that they are (in some cases) a necessary component of perception. This difference is important because there is no incompatibility between the top-bottom penetrability thesis and anti-representationalists stance. You could believe that in the case of complex cognitive systems their higher cognitive capabilities affect perceptions but that it does not preclude simpler systems from having perceptions without any conceptual influence. You could even believe that they can still be the same perceptions although this would have been rather surprising because it suggests that complex cognitive systems obtain the same effects simple systems do, but in a very contrived way. In contrast to this, if you hold that concepts are necessary even for relatively basic perceptions then you have no other way then to ascribe conceptual and thus (if you accept premise 3) representational capabilities to simple cognitive systems.

Note also that the Division Problem cannot simply be solved by adherence to the difference between subpersonal and personal perceptual states. At the first glance it might be tempting to identify direct perception states with subpersonal states. The temptation comes from the fact that the difference between subpersonal and personal states is definitely better defined than the difference between direct and indirect perception. But there are several reasons why we shouldn't go this route. First of all the examples of direct, nonconceptual perceptions, like perceptions of colors, simple shapes etc. that are indicated in the literature since Locke, are all examples of personal states. Second of all there is nothing in the idea of a subpersonal state that prevents it from being determined by higher cognitive capabilities. Concepts could as well unconsciously affect our subpersonal states. If we don't preclude the top-bottom cognitive penetrability thesis then we can just as easily decide that in some cases the penetration is not only possible but necessary. And last but not least this solution might have proven difficult for anti-representationalist we were trying to help. If non-conceptual means subpersonal than, in order to avoid a conclusion similar to (4) we have to a priori decide that the only perceptual states basic minds use are subpersonal states which is a pretty hefty assumption.

But before we proceed let me say a bit more about the key terms of “representation” and “concept” I will be using in the remainder of this paper. I believe that the best way to understand representations is to contrast them with an idea of a detector. This difference boils down to the fact that while the role of the detector is purely functional – it signals the presence of the target - representations present their target in some way, they characterize it somehow, present that things stand thus and so (Hutto & Myin, 2013, p. 62). The typical example of a detector is a fuel indicator used in cars. The typical example of a representation is a map. As (Cummins & Roth, forthcoming) show in their paper this difference cannot be overstated. The fact that representations present their targets in a specific way makes them usable even if their target isn't present. They can and are manipulated by the system and deliver new information about their target – for example, they enable the user to plan a new route in the mapped environment or give the system the ability to mentally rotate an object (Shepard & Metzlzer, 1992). Representations' ability to present the environment in a specific way isn't mysterious – it comes from the fact that they share some of the properties with their targets – for example, the map shares some of the structural properties with the mapped environment. This way of understanding representations

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3 Or „indicator” as (Cummins & Roth, forthcoming) whose strategy of explanation of the difference between indicators and representations I use in this paragraph prefer to call it.
is fairly common.\textsuperscript{4} Nothing of this sort can be said about detectors – as stated their role is purely functional they do not carry any information about their targets apart from the fact that they are present. The notion of detector is useful for our purposes not only because it contrasts well with the notion of representation. It will be important because I am going to argue that concepts are best understood as detectors and not as representations.

Speaking of concepts – at this point they should be understood simply as categorization devices. This, pretty broad sense is compatible with how most psychologists and traditional philosophers of mind used the word (Machery, 2011, p. 31). This general sense will be now fleshed out in the next section.

2.

Let's start by invoking a relatively old paper by Jerry Fodor which served as an inspiration of my account. In the article \textit{Why paramecia don't have mental representations} Fodor tries to answer a question that is similar to ours – when is the act of perception necessarily accompanied by a representation? When is perceiving also representing (Fodor, 1986)?\textsuperscript{5} Fodor's solution is that representations enter the picture whenever the observer starts to selectively react to a non-nomic stimuli. For example – if it is able to see a creased shirt then it cannot do it via a simple perceptual mechanisms because there are no laws of nature which specifically deal with creased shirts and every perceptual mechanism has to utilize lawful relations. So the observer has to have a more sophisticated mechanism underlying its ability to see creased shirts. That's what representations are supposed to be for.

As much as I like the idea that creased shirts are only in the eye of the beholder it is hard to be satisfied by Fodor's answer. Although interesting, this solution is flawed because it does not give us the tools needed to discern between nomic and non-nomic properties (Fodor acknowledges this). Even the example he uses is far from obvious. Thus, the Division problem isn't solved and consequently it may lead us to the dreaded conclusion (4).

The distinction between nomic and non-nomic properties Fodor invokes leads to one more doubt. How exactly is a normal, down-to-earth creature supposed to react to a non-nomic property? It may even seem that we want it to break the laws of nature or operate above them. To answer this challenge we may say that what the creature really does is detecting some co-referent property which is nomic. But if it is the case then why do we have to talk about it's non-nomic counterpart? Does it add anything to the explanation? If detecting of some non-nomic property \( p \) is in fact always mediated by the detection of some nomic property \( q \) then maybe there is no such thing as selective reaction to \( p \)? Insisting that the non-nomic property really is being \textit{detected} starts to sound rather mysterious and may be hard to swallow for the naturalist.

For these reasons I think that we should try a different approach. One of the ideas Fodor briefly takes into consideration is that the difference between properties which can be simply seen and properties which has to be represented lies in their detectability. Simple properties are properties which the system can literally detect

\textsuperscript{4} See (Palmer, 1978), (Johnson-Laird, 1983), (Hutto & Myin, 2013). There are also more liberal accounts of representation, for example (Roitblat, 1982) which do not require them to have this type of content but more often than not they lead to panrepresentationalism (Ramsey, 2010, p. 125)

\textsuperscript{5} Note that, although similar, Fodor's problem is slightly different from ours. Even if you accept the premise (3) and agree that concepts are representations you are not forced to believe that all representations are concept. Thus, establishing that some perceptions are representations does not mean that they are conceptual.
and properties which has to be represented are those which cannot be detected. Fodor quickly rejects this idea because he does not like the fact that it makes everything relative to the observer.\(^6\) Remember that the difference between nomic and non-nomic properties was ontological. If a given property is non-nomic than you couldn’t build a detector for it even if you had all the engineering skills in the world. Alternatively, the difference between detectable and non-detectable properties relies on anatomical specifics of the observer. Contrary to Fodor I think that we could embrace this relativistic consequence. Even if he is right in rejecting the difference between detectable and undetectable properties as a basis for a theory of representation I think that it might work quite well as starting point for a theory of concepts. Let me elaborate on this idea.

Consider a hypothetical cognitive system with some detecting capabilities. They are possible thanks to a typical set of receptors. Let’s call them “hard detectors” because they are physically realized. Although specifics of their functioning may be complicated from a technical standpoint there is nothing mysterious about them. Particularly – they do not produce representations and don’t need representations to function. Of course there are lots of properties in the cognitive system's environment which this system cannot detect using its receptors but which detection would have otherwise been beneficial. The system isn’t completely oblivious to these properties. It reacts to them in the sense that it is affected by them (but not via receptors). For example – a cognitive system without any receptors enabling it to probe the environment's temperature can be nonetheless affected by it – it can freeze, melt or change it’s operations in a more subtle way. The system detects internal states which are effects of these interactions and some of these internal states may be very important for it’s survival. Although it cannot detect some of these important properties sometimes the system is in luck and finds a co-referential property which it finds detectable (because it has a dedicated receptor for it). Let’s call this situation a case of “proxy detection”. This still doesn’t force us to talk about representations because proxy detection does not present it’s target in any way – it only informs of its presence. But sometimes the undetectable property is much more elusive. It seems to be present in a very heterogeneous group of objects. What I mean by that is that a specific internal state which the cognitive system detects and values corresponds to a heterogeneous group of stimuli. Because finding at least some correlation is always better than succumbing to a random strategy the system creates a new type of detector. Of course it cannot grow one so it combines the signals from the receptors it already had. The important thing is that the combination of signals isn’t utilized the way the proxy detector was used - it works more as a symptom or a working hypothesis in that it is always open to corrections. Its function is to signify the property which isn’t detectable and all the other detectable properties it uses to fulfill this aim may be otherwise completely irrelevant to the system. Let's call this type of detection mechanism a “soft detector” and the properties it consists of “auxiliary properties”. To sum it up, the three main characteristics of soft detector are:

1. It is set to detect an undetectable property correlated with one of the system’s internal states.

\(^6\) Fodor goes back to this idea in the sixth chapter of LoT2 (Fodor, 2010). His version of the difference between direct and indirect perceptions is the difference between registering and perceiving. There are two key differences between Fodor's later idea and my account. First of all it seems that what Fodor understands by detectability is an objective feature of some of the properties. So for example – the property of being a giraffe is simply not detectable (as opposed to being undetectable for selected cognitive systems). But there is no clear indication as to what exactly this difference originates from. Because of this it might be hard for us to solve the Division Problem. Second of all – the way Fodor solves the Distribution Problem is rather extreme. His concepts are necessarily connected to linguistic capabilities of the system. Therefore only language users equipped with proper concepts can be said to perceive.
2. It contains combined data from physical detectors.

3. It's content is purely functional, meaning that:
   a) It is not manipulated or processed outside of the detection context (contrary to representations)
   b) It is always open to modifications

Before we go further and see why it might be a good idea to identify soft detectors with concepts let's review the soft detectors once more using some more concrete examples.

A stickleback can detect redness of objects directly and we don’t have to attribute any representations to it to explain the mechanism of detecting red things. In this sense properties detected directly are very reminiscent of simple properties philosophers were talking about. Keep in mind that these were the properties which didn't need any conceptual input to be perceived. As we can see this intuition is retained by the simple notion of receptor or detector. But the fish uses this receptor also as a proxy detector. It uses it to find males. Note that at the first glance you could as well say that it detects males, but you shouldn’t be too attached to this description. In fact it may be argued that interpreting the fish's reaction as "detecting males" is a case of anthropocentrism and a violation of Morgan Canon. Note that this supposed "male detector" is too tightly connected with redness detector and surprisingly rigid – it is not open to corrections. The fish is equally attracted to red dummies as it is to males (Tinbergen, 1953). It may be safer to say that it finds the color red sexually attractive than that it finds males sexually attractive.

In fact we can easily find something similar in our own experience - most people are avert from very bitter things but they are genuinely surprised when they learn that this aversion can be traced back to the fact that many poisons have bitter taste. Yet, if a different intelligent life form was to describe our reactions it might have just as easily said that we are avert to poison. Another, similar example is that humans are typically attracted to sweets. Later we can learn that it is so because sweet things have high caloric value. We may be surprised by this fact because in our experience we are attracted towards the property of being sweet and not towards a property of having a high caloric value. And even after we learn “the true nature” of this proxy detection our habits do not change. That's why artificial sweeteners work.

And now consider a much different category, that is category of “food”. In contrast to the categories we just mentioned it’s important characteristic is that it is much, much more flexible. The fish doesn't need much training to learn to eat things which are vastly dissimilar to the food it finds in it's natural habitat. Another example would be the category of “tasty” objects. What the organism detects when it encounters tasty objects is only an internal state of a specific pleasure and not the property which causes it. The problem is that the set of objects which feel tasty is rather heterogeneous. But the need to detect tasty things is pressing. The existence of a soft detection mechanism means that the organism "assumes" that there exists a hidden intrinsic feature of all tasty objects. I used parentheses because this assumption isn’t propositional. It isn’t even a conscious decision. What I mean is only that the fish has a specific mechanism of using detectable cues in a peculiar way - it relies on them but is in a constant readiness to modify them on the fly. The data coming from the detectors can be, and often is, replaced by different data - accordingly to the experiences of the fish.

In fact there might be no single detectable property which has to always be present for the creature to be classified by it as "food" or "tasty". Furthermore, there may not be a single property which guarantees the same reaction during the lifespan of the fish. In other words, soft detectors do not contain necessary or sufficient conditions
for the property they target. In this sense they are very far from the traditional philosophical notion of concept.

Still, as evidenced by the title of this paper, I wish to identify concepts with soft detectors. There are two reasons for this. First of all most of contemporary accounts of concepts do not present them as sets of necessary and sufficient conditions anyway. We tried it for quite a long time and we all know how it turned out. Secondly (and this reason is much more important) - I am going to argue that soft detectors play exactly the same role that concepts were supposed to play in indirect perception. Let me show you what I mean.

Soft detectors explain the difference between simple and complex acts of perception, that is solve the Division Problem, in a naturalistic and definitive way. Simple, “pure” or “direct” perceptions, are these perceptions which are realized via physical receptors. Complex, or indirect perceptions are these perceptions which are realized via soft detectors. Whichever way a given organism detects a given property is a matter of empirical study. We can learn the answer by studying the receptor set of a given cognitive system (its set of physical detectors) and its behavior (whether or not it is easily deceived by dummy targets, whether the detection mechanism is rigid or not etc.).

This might be a good place to remind and emphasize that the distinction we obtain by adhering to soft detectors is always relative to a given cognitive system. One system’s soft detector can be a physical detector in a different system. For example – humans don't have proper receptors to detect H2O and because of that they have to rely on soft detectors as the ability of water detection is obviously important. But a different organism or a robot could have easily perceived water directly, that is detect H2O via some kind of physical detector targeted at this substance.

The other reason why soft detectors are a good candidate for concepts is that they help us understand in what sense some acts of perception are mediated by subject’s cognitive abilities. They show that this dependency isn't mysterious after all and does not require the organism to have any advanced cognitive skills. Particularly they do not suggest that the organism has to have any form of linguistic capabilities. Soft detectors are created by the observer and because of this there is no guarantee that that their targets exist. After all it wouldn't be especially surprising if there was no single property of "being tasty" (for the fish) but it does not change the fact that the fish expects it to exist. Keep in mind that this expectancy means nothing more than a constant readiness for revisions of the corresponding soft detector.

Another reason for understanding concepts this way is that soft detectors help us understand why, although we know that some of the properties cannot literally be seen, we still tend to prefer to describe these acts of perception as if we saw them directly. Even though I cannot really see that something is H2O or that something is a “human being” etc., saying so remains the most natural verbal report of my perception. Soft detectors help us understand that what we really mean when we say, for example that a dog sees a postman is that it successfully targets undetectable property of being a postman. We say that it sees a postman and not his symptoms because the symptoms are only functionally relevant and used as long as they correlate with the target property, so in a sense they are opaque.

It is good to contrast this flexibility with the simple features we detect by normal, physical receptors and with ad hoc categories humans can produce via language descriptions (Barsalou, 1983). In the first case the receptor has simply been selected or designed for a particular single job and either it does the job or it doesn't. It cannot be replaced even if it starts to be somehow erratic or obsolete in a new environment. On the other hand artificial ad hoc categories concern properties picked by humans
with descriptions like “objects I packed for the trip”. We are free when we create them but once in existence they are rigid. What belongs to a given \textit{ad hoc} category is strictly determined by the content of a relevant description. The mechanism of soft detection is set to detect an undetectable property. That’s why it cannot simply produce an artificial equivalent of it’s target constructed out of detectable auxiliary properties functioning as necessary or sufficient conditions. This way it could have easily loose it’s real target.

Another aspect of concepts which is often hinted at but which most of the time remains undeveloped is the dependency of concepts on their user’s experience (Smith, Osherson, Rips, & Keane, 1988). It seems to be highly plausible that concepts of a child differ from concepts of an adult (Vygotskii & Kozulin, 1986) and that concepts of people coming from different cultures may be different (Nisbett, 2004). But it is far from obvious how this dependency mechanism actually works. Soft detectors can help us here because of their dynamic nature. They are always in the flux because they are the effect of interaction between their user’s past and present experiences. Note that soft detectors do not reproduce a well known problem this sort of relativism normally creates. Even if two systems use soft detectors which differ in terms of their auxiliary properties, they can be said to be the same detector as long as they are set to detect the same undetectable property.

Last but not least it is worth pointing out that soft detectors retain also some of the more vague intuitions associated with concepts and indirect perceptions (although they do it in a somewhat deflationary way). The properties we perceive indirectly can be said to be more “general” because they are ascribed to a very heterogeneous group of objects. They can be said to be “immaterial” or “abstract” because their targets are never really detected by the system's receptors. Furthermore, simple perceptions seem to be more certain and less prone to error then those which are mediated by soft detectors because the former cannot be changed and the latter are constantly evaluated and ready for modifications. Of course physical detectors also can fail but in this basic sense every biological mechanism sometimes fails. Soft detectors can possibly lead to a whole new level of errors because it can always turn out that they didn't target any genuine property (when the group of objects happened to be too heterogeneous) or that their detection rate lowered significantly over time (when some of the newly encountered objects didn’t fit them as well as the old have done).

3.

How does the idea of concepts as soft detectors help us in our quest to save the anti-representationalist? Let's revise premises (1)-(3). As it stands, the premise (1) turns out to be ill posed. Everything can be directly perceived provided you have the right hardware. But if you reformulate it, it becomes easily acceptable:

(1’) There are such properties and such cognitive systems that these properties can only be perceived by these systems indirectly with the aid of concepts.

Not only is (1’) acceptable but, as indicated before, it does not lead to the Division Problem anymore. The difference between direct and indirect perception is well defined and depends on whether a given act of perception is realized by a hard or soft detector.

As to the premise (2) and the Distribution Problem associated with it - a given cognitive system (basic or not) has a fixed set of receptors and it perceives some of the properties through them. But it may as well display the ability to selectively react to properties it has no receptors for and be ready to adjust its detection strategy to the environment. It means that it developed a soft detector for a given property. Of course it might just as well be that it does not have such abilities – not every
cognitive system has to have them. Some systems can survive using only physical and proxy detectors – Fodor's paramecia might be a good example of such an organism. As it should be by now fairly obvious the premise (2) becomes a claim which can finally be evaluated empirically, provided that you settle on what you mean by "basic minds". But it is something the anti-representationalist has to do anyway. So now we are left with the premise (3). As mentioned earlier it is the claim I want to reject in order to block the conclusion (4).

When I introduced the idea of soft detectors I used expressions which seem to attribute propositional attitudes to their users. I am talking about expressions like "assumes" or "expects". I specifically used these metaphors because I wanted to paint a familiar picture in order to get my point across – that soft detectors work just like concepts were supposed to work in traditional philosophical theories. As pointed out before we shouldn't be deceived by this initial choice of language, because the cognitive requirements of soft detectors are very low. They are more like Noë's practical skills (Noë, 2004, p. 199) or "habits of mind", to use Hutto and Myin's Humean expression (Hutto & Myin, 2013, p. 15). One more time let's invoke the idea of a hard detector or a receptor. As established, they are not representations because they don't share any characteristics with their targets and do not present the world in any particular way. As Ramsey rightly points out the fact that a mechanism reacts selectively to a given stimuli doesn't make it a representation. Otherwise we would have to admit that immunological system represents diseases it reacts to (Ramsey untangling:8 xxx). The point is that the mechanism of soft detection does not differ as dramatically as could be suggested by aforementioned metaphors from the mechanism of physical detection. Just as with physical detectors the role of soft detectors is purely functional – they are fixed on their undetectable targets and not on their characteristics. They do not mirror their respective targets in any way. For example - being an odorless, clear liquid isn’t similar to being H2O in any understandable way, structurally or phenomenologically. It may be even easier to understand how close a soft detector is to a regular detector when you realize that a soft detector works best when it plays the same role as an equivalent physical detector plays in a different system. So if soft detectors do not have the crucial characteristic of representations but still can play the role concepts were suppose to play in perception we can accept (1') and (2) but stop before (4) by rejecting (3). We may say that although some cognitive systems (including us) need concepts to perceive certain properties it does not force us to attribute representations to these systems at this point. It is great news for the anti-representationalist. Not only did she get a tool for discerning between direct and indirect perceptions – on top of that she does not have to worry if some of the basic cognitive systems end up being concept users.

4.

Up to this point I consciously abstained from clearing some of the doubts which could have appeared along the way. The reason for it is that I wanted to have a clear presentation of the idea of concepts as soft detectors and their role in saving the anti-representationalist's position. It is nonetheless important to avoid some of the foreseeable confusions and answer some of the obvious questions.

Let's start with the most general question which might have occurred to the reader. How do we know if soft detectors exist? What exactly is the status of the account presented in section 2? It is important to understand that the idea of soft detectors does not come as a result of some new empirical discovery. Nor is it a speculation presenting a new mental faculty which hopefully will be soon discovered. We already know quite well that we are able to categorize objects according to properties which we have no receptors for. We know that we use verbal reports suggesting that we
perceive these properties although we cannot perceive them in a literal sense of the word. We know that cognitive systems which are a lot simpler than we behave as if they were able to do the same thing. We don’t need any new empirical data to establish all these facts. Moreover, some of the experiments show that postulated undetected properties tend to have higher priority in the categorization process. Soft detectors fill the theoretical niche between hard detectors and representations and help us tell a more believable story about perception because they tie some of the loose ends we were always having trouble with. Their theoretical status is exactly the same as the status of concepts. They are dynamic categorization devices used in perception which can be easily attributed to fairly simple cognitive systems.

Now let’s examine some of the more specific possible confusions I would be happy to avoid. First of all, it is important not to conflate the difference between soft detectors and ad hoc categories on the one hand with the difference between natural and artificial kinds on the other hand. On the face of it, it might be tempting. Soft detectors arise as part of a natural cognitive process. Ad hoc categories are consciously created language artifacts. It is only fitting that the former are better suited for natural kinds and the latter for artifacts. But remember that the observer cannot know a priori if a given object belongs to a natural or artificial kind so it’s detecting capabilities cannot be based on this distinction. We would have to assume that there exists a prior more basic classification process used to differentiate between artificial and natural kinds. Some of the well know examples of human behavior suggest otherwise – as (Putnam, 1975) points out in his seminal paper - people often seem to treat artifacts as natural kinds. We probably don’t have an artificial/natural detector, although it seems that we can easily distinguish between living and non-living objects (Leslie, 1988). But we shouldn’t conflate these - a sliding rock is a natural kind object that is not living. Moreover, as we established before, there is nothing in the idea of soft detectors that precludes basic cognitive systems from using them. For obvious reasons such systems cannot create ad hoc categories and because of that won’t probably use soft detectors exclusively for natural kinds as they encounter artifacts in their environment.

It is also important not to conflate soft detectors with natural indication. The difference is that what the cognitive system learns in the case of natural indication is that it should transfer some of its old reactions to a new stimulus. For example – it learns that it should escape not only when it sees fire but also when it sees smoke. But there is nothing fundamentally different between these two stimuli whereas in the case of soft detection such a fundamental difference exists because the target property is undetectable and the auxiliary properties are detectable. In this sense natural indication reminds proxy detection. But it differs from proxy detection as well in that it doesn’t transfer all the reactions to the new stimulus. For example, even though the smoke is the natural sign of fire you wouldn’t quickly take your hand out of smoke. It is also important to differentiate soft detectors from anticipatory mechanisms (like those presented in (Noë, 2004) or Miłkowski xxx). The difference is that unlike anticipation soft detection doesn’t simply precede a given experience. The experience of the undetectable property never takes place. In a sense I have never tasted H2O - only odorless and tasteless liquids quenching thirst.

You might be also asking yourself how exactly soft detectors differ from prototypes in prototype theory of concepts. To answer this we have to discern between two types of properties prototype theories build their prototypes from: typical and cue-valid properties. A property P is typical for a category of objects C if the fact that a given

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7 See (Ahn, 1998) or (Gelman & Markman, 1986).
8 Some researchers propose to differentiate representations according to whether they are representations of natural kinds or artifacts (Komatsu, 1992, p. 513)
object x belongs to a class C vastly increases the probability of x being P. A property P can be said to be cue-valid for a class C if the fact that an object x is P vastly increases its probability of belonging to the class C. “Having four legs” is a typical property for the class of dogs, “barking” is a cue-valid property for the class of dogs (Machery, 2011, p. 84). As you probably see the difference between these two types of prototype properties is very similar to necessary and sufficient conditions known from traditional theories of concepts. So the first important difference between soft detectors and prototypes comes from the fact that, as we saw in section 2, soft detectors do not have to contain neither necessary nor sufficient properties.

The other key difference is that prototypes do carry some information about their targets – their present them in a specific way. It can be easily seen by the way they can be evaluated. Similarly to maps, pictures or other examples of representations prototypes not only help the system target objects from a selected class but they are also supposed to be similar to objects from said class, be a model of them or carry more or less relevant statistical information about them. I guess that this is something most proponents of prototypes would gladly agree on. In contrast to that soft detectors' role is purely functional. There is no question as to how similar to the target they are because their targets are undetectable anyway so they cannot be compared.

The important thing is that this is not a difference postulated for difference's sake. Understanding concepts as soft detectors helps us explain things the prototype theory fails to account for. For example, as we saw in section 3 using the notion of soft detection we can easily discern between perceptions which need conceptual input from those that don't, that is solve the Division Problem. You just don't have this luxury with prototypes. Are relatively simple perceptions, for which there is no need of postulating a soft detector, correlated with a corresponding prototype – a prototype for redness for example? Or maybe it is rather that prototypes enter the picture only in more complex situations like seeing a postman?

Furthermore, soft detectors do not have some of the well known disadvantages of prototypes. For example, prototype theory has to deal with something Machery calls "the selection problem" (Machery, 2011, p. 85). It is obvious that prototypes do not consist of a fully realized detailed models of objects they are prototypes of. The question is – what exactly is the selection mechanism which takes some of the typical (or cue-valid) properties and leaves out the others? This problem doesn't affect soft detectors. They are comprised of whatever auxiliary properties proved to be working at the time because their only job is to detect their target. If enough auxiliary properties have been picked then there is no need in finding others because they never were to produce a model of the target. As dynamic categorization devices they can always change anyway – another feature that differentiates them from prototypes. Additionally, as should be evident at this point, soft detectors are very easy to reconcile with causal theory of reference and this is something that proved to be rather hard in the case of prototypes (Margolis, 1994)

I do not want to say that soft detectors fit into every context in which we were using the notion of concept. I believe that Machery is right by saying that the notion of concept is heterogeneous (Machery, 2011, p. 52). For example - in some cases (mathematics springs to mind) what we mean by concepts has much more to do with

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9 Typical properties being the equivalent of necessary conditions, cue-valid properties being the equivalent of sufficient conditions.

10 Even if criticized, the idea of similarity between prototypes and their targets is not abandoned (Rips, 1989)

11 Some researchers propose prototypes to be very detailed - see (Smith, Osherson, Rips, & Keane, 1988, p. 487)

12 Although I don't share his readiness to eliminate them from scientific vocabulary.
traditional explicit definitions with their necessary and sufficient conditions than with soft detectors.\textsuperscript{13} There are cases where it might be better to understand concepts as they are meant to be understand in prototype theory. My point is rather that the idea of soft detectors help us understand concepts as they figure in some selected contexts, most notably in the context of perception. In this sense they prove to be a very good explication for the notion of concept. They do things concepts were supposed to do for us but don't have their disadvantages - we are not burdened by the Division or the Distribution problems and don't have to assume that basic minds use representations.

\textsuperscript{13} Machery calls it classical definition of concepts. (Machery, 2011, p. 76)
Literature


