

2010-01-01

Dispositions, Propensities and The Change of Conditions

Alejandra Olivas-Davila

University of Texas at El Paso, aolivas6@miners.utep.edu

Follow this and additional works at: https://digitalcommons.utep.edu/open_etd



Part of the [Philosophy of Science Commons](#)

Recommended Citation

Olivas-Davila, Alejandra, "Dispositions, Propensities and The Change of Conditions" (2010). *Open Access Theses & Dissertations*. 2556.
https://digitalcommons.utep.edu/open_etd/2556

This is brought to you for free and open access by DigitalCommons@UTEP. It has been accepted for inclusion in Open Access Theses & Dissertations by an authorized administrator of DigitalCommons@UTEP. For more information, please contact lweber@utep.edu.

DISPOSITIONS, PROPENSITIES AND THE CHANGE OF CONDITIONS

ALEJANDRA OLIVAS-DAVILA

Department of Philosophy

APPROVED:

Juan Ferret, Ph.D., Chair

John McClure, Ph.D.

Peter Robinson, Ph.D.

Patricia D. Witherspoon, Ph.D.
Dean of the Graduate School

Copyright©

By Alejandra Olivas-Davila

2010

DISPOSITIONS, PROPENSITIES AND THE CHANGE OF CONDITIONS

By

ALEJANDRA OLIVAS-DAVILA, BA

THESIS

Presented to the Faculty of the Graduate School of

The University of Texas at El Paso

in Partial Fulfillment

of the Requirements

for the Degree of

MASTER OF ARTS

Department of Philosophy

THE UNIVERSITY OF TEXAS AT EL PASO

August 2010

Table of Contents

| | |
|--|----|
| Table of contents..... | iv |
| Introduction..... | 1 |
| 1. Dispositions..... | 3 |
| 1.1 What is a disposition?..... | 4 |
| 1.1.1 Causal Basis..... | 4 |
| 1.1.2 Contingency of Manifestation..... | 6 |
| 1.2 Conditional Analysis and Preemption..... | 7 |
| 1.3 Dispositions and Causation..... | 12 |
| 1.4 Renormalization..... | 15 |
| 2. Propensities..... | 17 |
| 2.1 Popper's Propensity View..... | 18 |
| 2.2 A Relapse to Frequency Theory..... | 22 |
| 2.3 Other Versions of Propensities..... | 23 |
| 3. Fundamental Differences..... | 25 |
| 4. Analyzing the Problem..... | 29 |
| Bibliography..... | 28 |
| Curriculum Vita | 30 |

Introduction

Given its present conditions, my coffee mug could break if stressed. Right now I could say that my coffee mug is fragile. If it was the case that my coffee mug was stressed against the floor or the wall, or whatever hard enough surface, it would manifest in breaking into pieces. My coffee mug would be able to break because it has the disposition of fragility. If I went and broke a bunch of coffee mugs under similar conditions and measured after the events through a probabilistic method, I could say that this coffee mug, if similar enough, has the propensity of breaking. But what happens if the conditions change? The floor could change by turning into a spongy surface, the coffee mug could develop so much fungus that it becomes unbreakable, or someone could catch the coffee mug as it was falling. So many other scenarios can change the way the coffee mug would react to its network of relations. A coffee mug might be just a trivial case, but it illustrates a deeper issue than losing a coffee mug to the evil floor. In order to talk about what causes the coffee mug to break it becomes helpful to understand the relation that the environment holds with certain actions. This relation can be understood as a disposition. In order to have some predictive value, we could test similar networks, and draw a probability after measurement, this would be a propensity. Now, there is a big problem has clouded the metaphysics of causation. In the words of Rudolf Carnap, he finds that:

“Hume was right in saying that there is no intrinsic necessity in a causal relation. However, I do not deny the possibility of introducing a necessity concept, provided it is not a metaphysical concept within the logic of modalities... in reference to the causal relation, it is not logical modality but causal modality with which we must be concerned”(Carnap 1966)

It's been a while since Carnap made that statement. Metaphysics does not have the same stigma that it did before the eyes of the logical positivists. If we are to consider the relevance of the subject in scientific inquiry then we can move this “logic of modalities” to an ontological sense, as Carnap states, in terms of “causal modality”. In order to move the discussion to the necessity of a causal relation, that Hume deprived

metaphysics from, some authors have argued for a particular type of property of systems. This argument is concerned with the nature of dispositions and propensities and how the change of conditions seems to keep taking us back to a humean picture of disconnected causation. Dispositions have been referred to under different names, such as potencies or powers, by Alexander Bird (Bird 2007) and Steven Mumford (Mumford 2003). This choice of name stresses the causal basis of a disposition. Some people have proposed views that refer to different types of properties but have been made related sometimes to the dispositions literature: capacities, tendencies, propensities.

With a similar aim as dispositions, but in a different discipline, we find in the works of Karl Popper an evolution of the frequency theory of probability. This evolution is identified as the propensity view. A propensity is a property of a system that attempts to provide an ontological evolution for relative frequencies. This is with the purpose of being able to 'objectively' interpret a series of repetitions. It is often the case that in the efforts to avoid the problem of induction and explain the relation between cause and effect, some authors try to reconcile dispositions and propensities. This conceptual cooperation might be a bit problematic if the implication of each concept is not analyzed in depth. It is therefore of crucial relevance to establish the theoretical differences and implications that each type of property entails.

The purpose of this paper is to draw a clear line that allows us to thoroughly differentiate dispositions from propensities as well as the big problem that clouds both views. I will attempt to offer an account of the main issues that these properties face. This paper consists of 4 sections. In the first section, I start by offering a general account of dispositions. In this account I offer a brief analysis of what it is to be a disposition. In this section the distinction between categorical and dispositional property is explored. I move on to explain the evolution of the conditional analysis, as well as the problems it faces. The next point has to do with the move from ascription to causation in the literature on dispositions. At this point I bring up the transition between sections by bringing up the issue of renormalization and the change of conditions in the stimulus-manifestation relation. This issue of the change of conditions, or renormalization of systems, shows that this

change of conditions seems to keep relapsing us into a disconnected picture of cause and effect. In the second section a general account of propensities is drawn. I offer different views within the propensity view, such as the one offered by Popper, Gillies, Mellor and others. The main problem for propensities is illustrated in terms of the duplication of conditions. In the third section I point out the main differences between dispositions and propensities. To finalize some helpful similarities found in both properties are analyzed in order to direct inquiry in terms of renormalization of systems. In the fourth section I explain the possible ways in which this discussion can go being one of them further research into probabilistic causation and the difference between systems before measurement and systems after measurement.

1. Dispositions

The challenge to offer a concise account of dispositions rests on the fundamental disagreement of what dispositions are and how they are identified. In this section I explain what the two main characteristics of a disposition are. Along the lines of the two characteristics I contrast dispositions and categorical properties for the sake of placing dispositions in context. After establishing the dispositional/categorical distinction I analyze the conditional analysis which has been the method that attempts to get at the role of dispositions in the world¹. The role of dispositions in the world has a focus on the ontological structure of dispositions. Some authors support a view in which dispositions are “essentially” what constitute relevant² properties in the world (Bird, Mumford, Shoemaker, Ellis, and Lierse). Some other authors support an account in which dispositions supervene on categorical properties (Armstrong, Prior, Jackson, and Pargetter). On this view we find a humean detachment when it comes to causes and effects. There are other authors that argue for a mixed view (Mellor, Ryder) in which some fundamental properties are dispositional and some categorical. Conditional analysis pertains to the disposition's ascription.

Under disposition ascription we find the attempt to carve up a general statement used to identify dispositions in terms of the stimulus-manifestation relation. The conditional analysis is affected by problems of preemption. Problems of preemption invalidate the conditional analysis as a general form to describe dispositions. These issues concerning dispositions' conditional analysis and their role in the world attempt to clarify what dispositions are and their role in a causal process. The focus of the ascription of dispositions blurs the focus on causation. I explain how some authors have shown that dispositions have a genuine role in the causal process. After explaining what a disposition is, the conditional analysis, the problems of preemption and the role of dispositions in the causal process, I analyze the change of conditions that

¹ My distinction between debates is just a helpful tool to keep the debates separated. This is not a distinction that can be found in the literature

² By relevant it is meant natural, sparse, real, physical properties (Bird, 2007)

dispositions face. At that point I'll introduce what seems to be the objective solution, which consists of a renormalization of the system.

1.1 What is a Disposition?

For a property to be considered a disposition it has to have the following attributes: first, the disposition has to have a necessary causal basis³; second, the manifestation has to be entailed by the relation that the disposition stands for, but the actualization of the manifestation is contingent. So in terms of the causal basis, if my coffee mug has a disposition that will allow it to break, this power that the relation gives to the network, to which the coffee mug is part of, is the causal basis. In terms of the second attribute, my coffee mug has the possibility of breaking, but the breaking doesn't have to occur. It is broadly debated whether these two attributes pick up something in the world, however, they are agreed to be the main characteristics that a disposition has.

1.1.1 Causal Basis

In terms of the causal basis, it has been said that “a property of a disposed object which can causally explain the manifestation of the disposition is called a causal basis of that disposition” (McKittrick, 2003). So the causal basis is a relation of the stimulus and the manifestation, which constitutes the disposition. According to the causal thesis the disposition stands for a relation. In this sense the causal basis along with “the antecedent circumstances is the causally operative sufficient condition for the manifestation in the case of 'surefire' dispositions” (Prior, Pargetter, Jackson, 1982). There have been some authors that supporting the causal thesis take the discussion to a further problem:

³ Dispositional properties are traditionally defined as opposed to categorical properties which have a contingent causal basis, or no causal role at all. For a thorough discussion on this distinction see Fara, M. (2006). Dispositions. *Stanford Encyclopedia of Philosophy*. Date retrieved February 25, 2009, from <http://plato.stanford.edu/entries/dispositions>.

“By the causal thesis, any disposition must have a causal basis, this causal basis is a sufficient causal explanation of the breaking as far as the properties of the object are concerned/ but then there is nothing left for any other properties of the object to do. By the distinctness thesis the disposition is one of these other properties, ergo, the disposition does nothing” (Prior, Pargetter, Jackson, 1982)

By the distinctness thesis Prior, Pargetter and Jackson argue that a disposition, even though related (somehow) to a causal basis, it is distinct from it. According to this, since the disposition is different from the causal basis, although related, it is utterly impotent. Some other authors like Jennifer McKittrick and Alexander Bird, separately, have defended the identity of disposition-causal role. McKittrick argues against Prior, Pargetter and Jackson by proposing bare dispositions. A bare disposition stands for a “disposition that has no distinct causal basis” (McKittrick, 2003). Bird, as will be discussed later, supports that to talk about dispositions is to talk about causation (Bird, Forthcoming). The discussion over the causal basis of a disposition takes place in categorical/dispositional distinction which will be discussed shortly. In order to put the distinction in context, we can discuss now the second attribute of a disposition.

1.1.2 Contingency of Manifestation

The second attribute is that the manifestation of some effect is necessarily entailed by the disposition relation, but the actualization is contingent. As stated above, a disposition stands for a necessary relation between the stimulus and the manifestation. Nonetheless, it might be the case that the manifestation never occurs. At this point it is crucial to stress that “dispositions exist and are really there, whether or not they are manifesting – the fragile vase is fragile even when not being struck and being broken – the fact that the manifestation is conditional on the stimulus does not make the dispositions itself conditional on the stimulus” (Bird, 2007), so, the manifestation of some effect is in a potential state until manifested. Regardless of the manifestation, the disposition is in an actual state.

Going back to the categorical/dispositional distinction “a categorical property, by contrast [to dispositions], need not be associated with a triggering event or manifestation” (McKittrick, 2003). The two attributes of a disposition are not held by a categorical property. The categorical property does not have a necessary causal basis, which means that it does not stand for a relation between the stimulus and the manifestation. For example “to say that something is square, is not to say anything about what it would do in particular circumstances, squareness has no associated manifestation or triggering event” (McKittrick, 2003). Squareness does not have a causal role; it only serves as a description. A description does not have a causal role per se. The categorical property serves as a description and implies a detached humean picture of cause and effect, where as the dispositional property implies a connection. This is the main difference between dispositions and categorical properties. When it comes to categorical properties “all that can be said about the essence of a categorical property is that it is identical with itself and distinct from other things” (Bird, 2007) by distinct it is meant that the property is disconnected from any causal basis.

The causal relation, stimulus-manifestation, for which a disposition stands, will be further discussed in section 1.3. Along the lines of the categorical/dispositional distinction, we find a method that attempts to carve up a general statement that ascribes a disposition. This method is the conditional analysis. I call it an attempt since it faces some problems that seem to hint at the disconnection of a disposition and its causal basis. This claimed disconnection, if successful, could leave us with a categorical picture of properties. But if there is indeed a connection, then:

“In fact the power’s [disposition] conceptual system, properly understood is just the metaphysics required by empirical science. The emptiness of the general regularity statement contrasts unfavorably with the promise of the power statement, which implies that the sleepiness is not fully explained by the fact of the ingestion of opium, but is to be looked for in the nature of opium” and attribution of a power opens up a certain direction of empirical investigation. It is not an attribution of occult quality, because it is not a quality-attribution at all.” (Harre, Madden, 1975)

And in this sense, the big promise is that dispositions might be a sound solution to the humean predicament by connecting cause and effect.

1.2 Conditional Analysis and Preemption.

In order to ascribe a disposition, the stimulus-manifestation relation has been studied through the conditional analysis. So the conditional analysis is a statement that describes a cause and effect relation. When we talk about the conditional analysis we are worried about the disposition ascription in which “the analysis of the ascription of such properties as brittleness, which can be ascribed without being manifested, has been the occasion for the introduction of the idea of a disposition. Similar notions such as propensity, trend, tendency and liability have been treated in an essentially similar way” (Harre, Madden, 1975) only the ascription of dispositions will be dealt with for now. In this section I will explore the different attempts to come up with a general claim for disposition ascription as well as the reasons for its failure. The conditional analysis that I use here is the one relevant to the literature on dispositions. Notice that there are other conditional analysis, such as the one for probabilistic causation, that will not be dealt with

One of the attempts for the disposition ascription was the entailment thesis. The entailment thesis is a tool that aids the categorical/dispositional distinction. According to the entailment thesis, the disposition is in itself a relation held by possible stimulus and manifestations that the object could have, such that:

i. *F* expresses a disposition iff there are an associated manifestation and conditions of manifestation such that, necessarily, an object is *F* only if the object would produce the manifestation if it were in the conditions of manifestation” (Fara 2006)

For example, say that my coffee mug has an *F* disposition of breaking if and only if coffee mug's disposition stands for a relation between breaking and a stimulus for the coffee mug to break. (i) Accounts for the beginning of a conditional analysis that places its focus in the necessity of the relation between a stimulus

and a manifestation. However, there are many problems that start at this point. The entailment proposal dismisses counterexamples that might stop the manifestation of some effect. But before discussing counterexamples, I will stress a crucial point in favor of (i). If it is necessary for a disposition to have an “associated” stimulus and manifestation then dispositions are actual properties of an object. In other words, the manifestation of some effect is in a potential state until manifested. This necessary relation seems to depend on two types of conditions, the relation or disposition, and the possible occurrence. In order to state this in a clearer way, and get rid of possible linguistic confusion a different expression took place. As dispositions stand for a relation between two situations that might not have occurred yet, the analysis of the conditions for a disposition to exist have two parts This two-part-ness calls for a particular type of conditional, the subjunctive/counter-factual conditional, where “a counter-factual conditional is an assertion that, if a certain event had not taken place, then a certain other event would have followed. Obviously, the meaning of this assertion cannot be conveyed in a symbolic language by using the truth functional conditional in the sense in which it is ordinarily used” (Carnap, 1966). So because of this particular type of relation a regular material conditional is not enough to conditionalize a situation. The subjunctive/counter-factual conditional is stated as follows:

$$\text{ii. } D_{(s,M)}x \leftrightarrow (Sx \rightarrow Mx)$$

So, x is disposed to manifest M in response to stimulus S , iff were x to undergo S , x would yield manifestation M , where \rightarrow represents a subjunctive conditional. Back to the example above, (ii) expresses that the coffee mug is disposed to break iff it was to go through a certain stimulus, in this case being stressed would yield the manifestation of breaking. This type of conditional attaches two possible situations, in this case the relation that a disposition holds $D_{(s,M)}x$, and the possible occurrence of the stimulus and manifestation $(Sx \rightarrow Mx)$. These two parts are joined by an “if and only if”, which is a biconditional operator. A biconditional demands that both sides of the statement be logically equivalent.

This equivalence is inflexible and general. This conditional analysis establishes a simple ascription of dispositions, however:

“The problem of what the assertion of a power or disposition to a thing means when it is not exercising it is not really solved in this [conditional] analysis. To say that to assert that particular piece of glass is brittle is to make a prediction about how it would behave if certain conditions were fulfilled is not enough since it leaves the intractable problem of truth conditions of the subjunctive conditional conjunct in the analysis unresolved.”(Harre, Madden, 1975)

(ii) is susceptible to counterexamples⁴, or in the words of Nancy Cartwright “there are a number of things that can usually be done to dispositions to affect their manifestations” (Cartwright, 2007). Cartwright makes reference directly to the manifestation. These counterexamples prevent us from being able to ascribe a stable manifestation to a disposition in this manner, since they stop (antidotes), imitate (mimics), or modify (finks) the disposition (stimulus-manifestation relation).

Finks, according to Alexander Bird “arise because the time delay between stimulus and manifestation provides an opportunity for the disposition to go out of existence and so halt the process that would bring about the manifestation”(Bird, 2007), so the stimulus occurs but the disposition is lost in the lapse of the time between the stimulus and manifestation; thus, the manifestation does not manifest, since there is no property, anymore, in the object that will be recipient and reactionary to the stimulus. As an effort to salvage the conditional analysis, David Lewis proposed a reformed conditional analysis:

iii. Something x is disposed at time t to give manifestation M to stimulus S , iff, for some intrinsic property B that x has at t and for some time t' after t , if x were to undergo stimulus S at time t and retain property B until time t' , S and x 's having of B would jointly be an x -complete cause of x 's giving response M

⁴ These counterexamples are found in the literature under other tags, such as masking issues or preemption.

In this case, Lewis does away with finks by specifying that the disposition has a time range for action. In this way the conditional analysis, in its reformed shape maintains the disposition ascription. So the coffee mug's fragility would be finkish if it was to expire at some point after the interaction with the floor or the wall or whatever sufficiently hard surface.

Another type of counterexample to the conditional analysis is the existence of *antidotes*. An antidote is a counterexample that breaks the causal process that will conduct to manifestation. Bird uses the example of poison,

“It is possible to ingest a dose of fatal poison yet survive if one has also taken an antidote...the poison is left unchanged, and a fortiori the causal basis of the poison's disposition to kill is left unchanged...the environmental conditions are not appropriate for the poison to have the effect it would normally have. In such a case the antidote to the poison is...something that interferes with the conditions that are normally appropriate for the functioning of the disposition” (Bird, 2007)

So in this counterexample the change in the conditions affects the manifestation even though the stimulus occurs. Since the environmental conditions might change, the conditional analysis fails in the case of antidotes. In this case the coffee mug's fragility is still there but nonetheless some changes in the conditions, say a change in the external structure of the coffee mug, like a bubble, thus antidoting the system from breaking.

A third case of counterexamples has to do with *mimics*. In this case, the manifestation occurs but not by virtue of the stipulated disposition, but by virtue of something else that has interfered and mimicked the effect. Similarly to the antidote example, there could be a neighboring force that interferes to break the coffee mug but does not take part in the stipulated stimulus-manifestation relation. Note that this does not mean that the disposition ceases to exist, but something else acts in the same way.

These issues of preemption show the precarious situation that the conditional analysis confronts, the problem of a change in the conditions. The implications of the change of conditions will be further explored in section 1.4

1.3 Dispositions and Causation

The conditional analysis tends to take a focus on language. This could be a problem since it could be the case that language fails us when it comes to accurately ascribing dispositions. If when dealing with fragility, its meaning is “to be “if maltreated, it will break” together with a trail of subjunctive conditional of varying degrees of specificity whose role is to capture the force of ascriptions of brittleness to those things which did not break, or have not yet broken” (Harre, Madden, 1975) then it could be that our language is not sufficient to state a dispositional form. Nonetheless, the accuracy of the ascription has been debated above in terms of the problems of preemption. Even so this is a different type of problem. The conditional analysis attempts to carve up a general statement of the conditions that would explain the relation that a disposition stands for. The conditional analysis ascribes a disposition in the form of a biconditional statement, which generalizes the possibility of an occurrence to the possession of a disposition. There have been some efforts to place the argument in a more straightforward ontological sense. From issues of ascription, the argument has moved on to issues of causation. The argument moves onto causation in order to get a clearer understanding on the reactionary role that a disposition has. Alexander Bird supports that “fragility and elasticity...illustrate the relations of disposition to manifestation and to stimulus...these examples seem to indicate a causal relation”⁵ (Bird, Forthcoming). So Bird explains how it is that a disposition is more than just a term. It is because we can talk about dispositions that we can move the argument back to the problem of change in terms of causation. In this type of argument it is assumed that because there are certain occurrences that seem to depend on a property, ex. Fragility, solubility, elasticity.

⁵ In this article Bird discusses the two types of causation according Lewis’ distinction, but mainly focusing on the role of dispositions as interaction enablers, or as the ultimate causal agents.

So it is because we can talk about fragility that the term seems to reflect a causal link, ex. disposed to break if stressed. Bird proposes a new conditional analysis, but this time, he proposes one that tackles causation. The simple dispositional analysis of causation can be understood in the following way:

iv. “A causes B when A is the stimulus of some disposition and B is the corresponding manifestation”
(Bird, Forthcoming).

Hitting the floor *causes* the coffee mug to break, when hitting the floor is the stimulus of the coffee mug's fragility, and breaking is the corresponding manifestation. The difference with this new type of conditional analysis takes place in the focus on the causation part. In this analysis of causation, the disposition is considered directly a reactionary relation, whereas in previous analysis the disposition had been considered an individual property. Bird holds that:

“One might argue that (SD) [Simple Dispositional Analysis of Causation] provides no insight into the nature of (at least basic) causal relations. We wanted to understand the causal relation but have just replaced it with the stimulus-disposition-manifestation relation...And if anything the stimulus-disposition-manifestation relation is less well understood than the causal relation (Bird, Forthcoming, p.7).”

The efforts in the dispositions' literature were to understand what is there in objects that makes them react to a certain environment. According to Bird, the focus on the generality of a dispositional statement seems to underestimate the big issue, in this case causation, however, the nature of dispositions, if there is any, will be analyzable once we have a clearer understanding on the nature of causation.

Now of course this focus on causation is not supported by categorical monism. For the categorical monist, given the causal disconnection, there is no point in attributing causation to dispositions. Even so, the insight

that Bird provides into the circularity of dispositions and causation seems to point inquiry in a different direction.

1.4 Renormalization

The discussion has, at least in the words of some advocates⁶, turned into a more concrete issue, causation: “while the analysis in terms of dispositions provides no conceptual reduction, it does provide insight in the metaphysics of causation” (Bird, Forthcoming). The great obstruction that the issues of preemption posed for dispositions are inherited by this new approach. It is important to point out that this obstruction that is faced by the conditional analysis in dispositions has to do with the lack of renormalization of a system. As it was mentioned above, antidotes and mimics make the conditional analysis fail, because of a change in the environment where the disposition is putatively located. So if we change the conditions in our example of the coffee mug's possibility of breaking, it might be the case that this conditions result necessary for the breaking to occur even if the stimulus occurs and the disposition is present. It seems to be troubling if we assume that after a change in the environmental conditions we are still talking about the same system. If we are talking about a different system, it can't be said that the relation held before is necessarily the same. In this sense in order to give a proper analysis of causation the originally assumed system has to be renormalized, given that previous normalization is not in place anymore. If the initial conditions that the system had happened to change, then it would be incorrect to refer to the system in the same way as it was assumed to be. The boundaries need to be redrawn. The system needs to be renormalized.

This far we have gained insight on a bigger issue than locating dispositions, which is the effect of the change of conditions. Given a careful renormalization of the event, the expectation of certain results should be more accurately kept in track. However, this would imply a different type of discussion that does not belong in the realm dispositions, but in that of propensities. It has been stated before that a disposition is

⁶ Bird (2010)-Causation and the Manifestation of Powers- in his conclusion

the relation between the stimulus and the manifestation. So in the example this relation is held by the possible breaking of the coffee mug and the coffee mug hitting the floor hard enough. Consequently, if the conditions change, for example a protective bubble emerges around the coffee mug, or the hard floor changes for soft feather then a renormalization is required. In order to keep the system in check, “duplication”⁷ of the events is required. This duplication would be recorded in terms of the manifestation demonstrated by the duplication. But in this case we would not be talking about a disposition, but exclusively about the manifestation and about the conditions that produce a causal chain to where a similar manifestation keeps occurring. Now, I'll move on to analyze the propensity view.

⁷ Even though a full duplication of conditions is not possible, the propensity view, in most of its variations, supports an assumed duplication that repeat as successfully as possible the conditions that appear to be necessary

2. Propensities

There have been various advocates for the propensity interpretation of probability. Among the views there is the view that developed the propensity view from scratch parting ways from the frequency theory (Popper). Some authors have developed a mixed view between propensities and frequencies (Gillies). Some authors have tried to reconcile the propensity view with the literature on dispositions (Mellor, Liu, and Suarez).

The general aim of the propensity interpretation is to show that propensities are the likelihood occurrence of a single event. Propensities had traditionally been defined by frequentist generalizations. It was assumed that “the frequency interpretation can explain singular probability statements...it attributes to the single event a probability merely so far as this single event is an element of a sequence of events with a relative frequency” (Popper 1956), so, a relative frequency was drawn, and a numerical value would be attributed to the pattern. A property and its percentage of likelihood of occurrence would rely on a series of repetitions. The attribution of a number to a property depended on previous events. The event in matter would have a set of properties attributed from a generalization that took place in completely independent (separate) events. This represented a problem considering that the “frequency interpretation is an attempt to do without physical reality, an attempt which...is not in all fields completely successful” (Popper 1956) and thus, Popper suggests that “it [frequency interpretation] will have to give way...to the propensity interpretation” (Popper 1956).

2.1 Popper's Propensity View

In Popper's view, propensities are drawn in a case per case basis. According to Popper, “the propensity interpretation attaches probability to a single event representative of a virtual⁸...sequence” (Popper, 1956). The propensity depends on the set up in which it is carved up, this set up “attaches to event *a* a probability

⁸ He refers to virtual in terms of an observable property

$p(a,b)$ by considering the conditions which would define this virtual sequence". The propensity relies on the conditions, or set up, in order for it to manifest " b [stands for] the conditions that produce a hidden⁹ propensity, and that give the single case a certain numerical probability" which means that propensities are reference frame-dependent.

A problematic issue in the carving up of propensities emerges, since "to test the ascribed numerical probability, we shall have to realize a segment of the virtual sequence long enough to make it possible to apply to it a significant statistical test" (Popper, 1956) so the conditions have to be replicated. If the propensity is assumed to be a single event's likelihood of occurrence, the duplication of conditions puts the singleness of the event to question. But in order to corroborate theoretical results the conditions must be realized:

"Every scientific theory implies that under certain conditions certain things will happen. Every test consists in an attempt to realize these conditions, and to find out whether we can obtain a counterexample even if these conditions are realized...a ceteris paribus clause like 'all things being equal' must not be added to a theory since it would destroy its testability" (Popper,1956)

So Popper realizes that assuming that a replication of the event can occur is methodologically dismissive and physically not possible. In light of this problem, Popper accepts this impossibility and settles for "an attempt" to make this replication as close to the original event as possible.

Given this problem of duplication of events, it seems to be crucial to be able to distinguish propensities from mere frequencies. Popper argues for a causal hypothesis. When propensities are contrasted with relative frequencies they can be distinguished by their ontological stance with regards to their causal role. Propensities, in this sense, are no longer theoretical generalizations, as relative frequencies were

⁹ What Popper means by hidden propensities has to do with the assumption that the relation between the overall conditions of the event already contain the propensity itself, even if the manifestation has not occurred yet.

considered to be. The causal hypothesis moves on from an issue of ascription to an issue of causation.

Popper argues that a propensity fulfills the role of an epistemic tool, but also, moves on to an ontological position since “from the point of view of the propensity interpretation, causal hypothesis can easily be interpreted as a hypothesis asserting a propensity equal to 1...which gives rise to singular predictions...that is ‘occurrences’ ”(Popper,1956). Occurrences for Popper have a physical relevance. This relevance has lead some debates (Liu 1996, Suarez 2004, Mellor 2005) to place propensities in a subset of dispositional properties. However, if analyzed closely, propensities stand for a different type of relation than dispositions.

Propensities can be taken to be likelihood of occurrences, but their occurrence is not necessary. This type of description sounds awfully similar to that of a dispositional property. The problem that dispositions face in terms of deriving a general statement was the issue of preemption. In the case of propensities, stipulated preemption is included in the rest of percentage:

v. Propensity $XX\% \geq 0$ given conditions $x, y, z...$

Ex. Coffee mug's fragility, likelihood of occurrence= 20%, preemption =80%¹⁰

In this way counterexamples are considered, in this case per case basis, by being reflected in the rest of the percentage. The experimental conditions described in (iii) are not self explanatory. It is pertinent to establish that the reference frame dependency of the results with the set up is an issue not of our knowledge but of the way things are. Again, going back to the duplication of conditions, depending on how the event occurs, the outcome of the event will reflect different properties at play. Popper identifies two main aspects, the first one as “variations of conditions” (Popper, 1956) and the second one as “keeping constant the conditions which are mentioned as relevant in the hypothesis” (Popper, 1956).

¹⁰ By preemption here I mean the preemption of that particular event. This preemption percentage should serve as a guide but not as an accurate reflection when the assumed duplication of conditions takes place. The percentages used in the example are fictitious.

The first aspect has to do with a problem embedded in any static methodology. A dynamic system requires a different normalization; therefore, it falls out of the parameter of many methods. Yet, dynamism of properties is what motivates a case per case basis, in order to avoid generalizations that fail to notice a change of states.

The second aspect that Popper points at has to do with an (apparent) unavoidable relapse to a frequentist methodology. The issue of duplication of conditions is of full concern here. The experiment has certain characteristics. These characteristics are the experimental conditions. In order to test the propensity “it is therefore absolutely essential for a repetition of an experiment that each repetition occur under the same stated conditions” (1956) otherwise the results of the experiment would be pertaining to a different object. Another point that Popper illustrates is that in order for the test, and duplication of conditions to be possible, “in the experimental set up, the earlier experiments must not affect the latter ones” in a way in which “there must not be an after effect of earlier experiments upon the latter ones” (Popper, 1956). The duplication of conditions, even though is a duplicate, it must be independent. If independence is not achievable, then there is something affecting the new experiment that will not allow it to show separate results. For Popper it is crucial to consider propensities in an ontological sense, but it still seems hard to break away from frequencies given that:

“the strong law of large numbers gives us a strong relation between certain cases of propensity (independent and identically distributed trials) and relative frequency, but it would be an overestimation of this result to claim that propensities are relative frequencies or even that in a large number of trials, propensities must be close to relative frequencies” (Skims, 1980)

The strong law of large numbers states that “the probability and the relative frequency of an event are, with a sufficient number of trials, with a very high probability close to each other” (Von Plato 2001) and so it seems that going back to an epistemic “after measure theoretic” version of probability is hard to avoid since

“variation and irregularity in the small [sequence] leads to regular behavior in the large [sequence] (Von Plato 2001). So following the law of large numbers it is assumed that we can derive the systematic change of conditions. In the case of the coffee mug, a large number of coffee mugs would be required to break so that a good probability could be recorded. The problem here would be that we can only break the same coffee mug once, at least under the same environmental conditions.

2.2 A Relapse to Frequency Theory

This issue has been treated by Gillies in a different fashion than Popper. Gillies questions “does repeatability imply independence?” (Gillies, 2005). If it is the case that some conditions can be repeatable to test the manifestation of certain properties, then how dependent is one event from the previous? Gillies supports that “we should assign probabilities only to the outcomes of sets of repeatable conditions whose repetitions are independent”, so in a more frequentist manner, he recommends that conditions that imply dependency of events should not be part of the new event. The reasoning behind the rejection of dependent repetitions is that the new event won’t be 'new' anymore; therefore the assigned probability won’t belong to this new test, but to the series of repetitions as a whole. If it is the purpose of the propensity view to carve up single case probabilities, then the repeatable conditions should define the outcome by themselves. In order to make progress in his argument, Gillies bases his view of propensities in terms of Kolmogorov's axioms¹¹, with an addition that he calls the axiom of independent repetitions. Gillies’ addition relies on a series of meta-analysis that check duplicated properties in a system over

vi. “a series of repetitions of S_s ...select a particular n -tuple of these repetitions, say (i_1, i_2, \dots, i_n) . This procedure can be repeated over and over. In each case we form a sequence of repetitions of S_s , and then

¹¹ Gillies works under the assumption that Kolmogorov’s axioms, along with the amendment that he has provided -the axiom of independent repetitions- serve as the bridge “from the abstract mathematical axioms to the world of experience” (Gillies, 2001)

select the same n -tuple of these repetitions. The procedure is thus itself a set of repeatable conditions which will denote by Ss .” (Gillies, pp.164)

In the case of the coffee mug breaking, the event would have to be repeated over and over, then the repetitions would be coupled in order to analyze variations and so be able to tell which conditions are producing repeatedly the breaking. Not to mention that in order for the long run of repetitions, there would have to be many coffee mugs being broken. We can only break the same coffee mug once under the same conditions. The obvious fallback to frequency theory that Gillies provides is justified on the “derivation of these empirical laws, which are confirmed by a mass of data” (Gillies,) which to him allows the propensity view to incorporate long runs of repetitions in order to attribute objectively a probability to a property.

2.3 Other Versions of Propensities

In the application of the propensity view we find a variety of attempts to unify, and in some cases equivocate, dispositions and propensities. According to Mellor propensities “are tendencies, or probabilistic dispositions” (Mellor, 2005) in other words, Mellor considers propensities in terms of measured probabilities. This view places a conflict of interpretation since “the propensity is ascribed to a single toss, whether or not the condition that defines the propensity is met, just as fragility is ascribed to a single object whether or not the condition that defines fragility is met” (Mellor,) In this example, Mellor refers to the propensity in the same way one would refer to dispositions, since the manifestation is not a requirement for the disposition to hold the S-M relation, it seems like for Mellor it would be the same case for propensities. Chiang Liu, in his 1996 article, assumes that propensities, or as he calls them “propensional properties”, are “probabilistically dispositional”. He illustrates his assumption in the following example: “Similar to a vase being fragile¹², an electron is locatable in that it has the propensity of being found when measured at one of the possible locations within the extension of the packet” (Liu, 1996). For Liu, a propensity, in this case of

¹² He uses the case of fragility, being one of the typical examples in the literature on Dispositions.

the electron being locatable is the likelihood of this occurrence within a range provided by the extension packet. Just as Mellor, Liu differentiates dispositions from propensities in terms of measured probability.

A more elaborated view, also among the incorporation of dispositions and propensities is the one provided by Mauricio Suarez. By providing a conditional analysis of propensities, Suarez (2006) defines propensities as “a probabilistic disposition, i.e. a dispositional property, whose ascription does not imply a conditional with a deterministic clause in the consequent, but a general probabilistic clause instead”. Suarez seems to assume that dispositions entail a deterministic relation, when in fact they the relation connects stimulus to manifestation, but the manifestation is not determined to happen. This deterministic relation that he assumes should stand instead for a necessary connection between stimulus and manifestation. By adding the “general probabilistic clause” he switches from probability 1 to probability p in order to explain issues of preemption and failure of accurate duplication of conditions. In this view, propensities take a role much like dispositions, the only problem for Suarez' view would be to acknowledge that propensities have an after measurement status, when dispositions are not measurement dependent. Suarez does not get deeper into the nature of the causal relation that a propensity might hold.

3. Fundamental Differences

In all views, the general claim is that propensities are carved up in terms of the result of a manifestation measured by a probabilistic method. A propensity is sometimes described to be a probabilistic disposition¹³; however, as a result of a repetition, or series of them, propensities do not refer to the same type of relation that dispositions do. Propensities have to do with the measurable manifestations, not with the whole stimulus-manifestation relation that a disposition stands for. Even if the duplication of conditions occurs as similar as possible, it cannot be said that the event is the same since it is a repetition. The fact that the propensity is carved from different manifestations seems to imply categoricalism as opposed to dispositionalism. This categoricalism could be implied in terms of the static type of result that a measurement might offer. In the best of cases, if we assume that a propensity is objectively carved up, it is still not a relation, it is the after measurement result of the different occurrences. In this sense, a propensity is more like a categorical property in terms of the causal disconnection. Now without pushing it too far, it might be the case that propensities have a say in a causal process. Popper assumes a causal hypothesis in order to keep the causal connection and ontological relevance. The causal hypothesis has the same role as the causal basis for dispositions, so in this case it could be argued that the assumption holds or doesn't for both. In the case of propensities, because they are carved after occurrence, then causal hypothesis is just an after measurement assumption. In the case of dispositions, the causal basis is necessary for the disposition to hold the stimulus-manifestation relation, so there would not be any manifestation at all if the causal basis was not there.

At this point another question might arise: what if the propensity was there all along before the measurement occurred. If it was the case that the propensity was there independent of measurement, then the similarities with dispositions would be still questionable. According to Popper "dispositions are taken to

¹³ Propensities are sometimes equivocally used as dispositions. D.H. Mellor, "propensities are tendencies or probabilistic dispositions". C.Liu 1996 "(Microscopic)objects appear to have propensities, ie., probabilistic dispositional properties" . M.Suarez 2006 "a propensity is always a kind of disposition, but not vice versa"

be responsible for the statistical frequencies with which they will in fact realize themselves in long sequences of repetitions of an experiment. Propensities are thus introduced in order to help us explain, and to predict, the statistical properties of certain sequences; and this is their sole function" (Popper 1956), so in this sense even though Popper attributes ontological relevance to propensities, but the ones doing the causal work are the dispositions, leaving the propensities as post-measurement entities. Consequently, propensities "draw attention to unobservable dispositional properties of the physical world, and thus help in the interpretation of physical theory" (Popper 1956) but always keeping the distinction between measured manifestations and stimulus-manifestation relation. In a more extensive way, Popper brings attention to the huge relevance of what is doing the causal job here. This causal job might be affected by any change of conditions in a sequence of events:

"by drawing attention to the fact that these sequences are defined by the manner in which their elements are generated -that is, by the generating conditions- we can show that we are bound to attribute our conjectured probabilities to these generating conditions; we are bound to admit that they depend on these conditions, and that they may change with them...this allows us to interpret the probability of a *singular* event as a property of the event itself, to be measured by a conjectured *potential or virtual* statistical frequency rather than by an *actual* observed frequency"(Popper, 1956)

So Popper manages to keep the ontological status of a propensity as an after-measurement probability, but blames the result of the measurement in what he calls "generating conditions". These conditions were explained earlier in terms of the environmental conditions of an event. As repetitive as it is, if the conditions change, the causal link changes as well. So the causal role belongs to the environmental conditions necessarily, since they dictate the path of the manifestation. In that previous quote, notice the italicized words. Popper relates propensities with "conjectured potentials"; these potentials refer to the possibility of manifestation. Since a propensity is an after-measurement property, it has to be in a state contingency given that there is no pre-measurement data. The "actual observed frequency" would refer to previous

manifested events that have no predictive value, assuming that the causal job is being done by the single event's environmental/generating conditions.

The issue of the repetition of conditions has some correlations with the issue of preemption in the conditional analysis, which is, in my opinion, the main reason why some philosophers equivocate the terms. In the propensity view the biggest issue is duplicating the environment of the event in order to be able to identify the set up of the event as a causal agent. This is in order to insure that the next time that these conditions are met, the result will be manifested in a certain way again. All these efforts to make the results of the measurement more accurate have for a purpose to be able to say that the properties that the methods keep outputting are in fact ontological. If it is the case that we can identify the causal mechanism then the problem of induction would not be so much of a problem anymore. This would be due to the fact of the connected cause and effect that the mechanism would provide, at least in terms of single cases. Still, as it was expressed above in section 1.4 the failure of the conditional analysis is not the problem of preemption but the lack of renormalization. If an assumed system is being analyzed in terms of causation and somehow there are changes in the system, say environmental changes, issues of preemption might occur. If the environmental conditions change, then the system needs to be renormalized, otherwise we are not talking about the same system. By renormalization the boundaries of the system need to be analyzed and redrawn. The correlation of the duplication of conditions and the conditional analysis is that in order for us to make a general (ontological) statement it seems necessary for the statement to survive exceptions. In the case of dispositions, these exceptions are issues of preemption, in the case of propensities, the duplication of conditions. But again the distinction lies in the fact that a propensity is carved up from manifested measurable results, whereas the disposition speculates a reactionary relation (between stimulus and manifestation) that might go with unmanifested effects.

4. Analyzing the Problem

The predictive value that dispositions provide is close to nothing. As it has been shown in previous sections, dispositions are hard to identify. It almost seems like dispositions are this funny ad hoc argument to assume that there is a property responsible for causation. It may appear like in order to study cause and effect we can just attribute the causal job to a disposition, (stimulus-manifestation relation), but as Bird points out, it seems like the stimulus-manifestation relation is harder to pinpoint than that of cause-effect. The valuable lesson that dispositions offer is an attractive view at the problem of induction. So as Bird has pointed out within causation we'll find answers to the nature of dispositions. A full account of the disposition-causation circularity falls outside of the scope of this paper, but serves to illustrate the need for a better understanding of the change of conditions in order to gain predictive value.

The predictive value that propensities have seems to be more available than that of dispositions. Propensities provide accessibility to certain events, which in certain cases proves to be successful. From this success and the focus on the reevaluation of conditions propensities have been used to attempt to clarify some objective probabilities found in quantum experiments¹⁴. This usefulness has a long way to prove its objectivity. Propensities are assumed to work under the causal hypothesis. This causal hypothesis still falls short in ontological content. This shortage of causality should be fixed by looking at the connection that dispositions have. This connection holds the key between environment and change of conditions.

For the reasons that have been already pointed out, dispositions and propensities refer to different things. But some have used propensities in order to assume a causal link of certain properties after measurement. This is because of the useful tool that probability has shown to be. An interesting place to look at for further research could be probabilistic causation, but keeping in mind that propensities do not refer to the same relation as dispositions. It might be that in the way of studying objective probabilities we might be able to

¹⁴ Different authors attempt to explain some observables in terms of the propensity view. (Liu, 1996, Suarez, 2006)

pinpoint the stimulus manifestation relation, through the study of propensities, until then it is relevant for the sake of good conceptual analysis to keep these two properties conceptually separate.

A way in which dispositions and propensities can benefit each other is by evaluating issue of renormalization. The change of conditions clouds both dispositions and propensities. The first systematic normalization is subject to revision at any time. As shown through the issues of preemption or by the impossibility of duplication of conditions it seems necessary for proper metaphysics to deal with the issue of redrawing the boundaries of a system. This insight is that the causal properties that might be doing the job might act in different ways depending on the environment. For this reason the way that dispositions as well as propensities are carved up falls short, at this point, when it comes to the change of conditions. If the initial concern is the question of how the mechanism of causation takes place, then we are required to renormalize the system, say the coffee mug, and study it in a case per case basis to avoid conditional generalizations that might not apply to the system at the time of measurement.

The big insight that can be gained from the disposition-propensity distinction is the difference between a system before and the result after measurement. On one hand, a system before measurement holds a stimulus-manifestation relation, necessarily. That is, the system has not manifested a particular effect, nonetheless it has the actual property of being able to behave in a certain way if the environmental conditions make it so. On the other hand, the result after measurement is a static, concrete result that tags a particular state of the system even if the system is dynamic. In other words, propensities, as an after measurement result, is what we can say about the system at a given time, when the disposition is a relation that holds dynamically.

Bibliography

- Bird, A. (2010). "Causation and the Manifestation of Powers". *The Metaphysics of Powers*. Routledge: London. Ed. Anna Marmodoro
- Bird, A. (2007). *Nature's Metaphysics: Laws and Properties*. Oxford UP: Oxford.
- Carnap, R. (1966). *Introduction to the Philosophy of Science*
- Cartwright, N.(2007). "What Makes a Capacity a Disposition". *Dispositions and Causal Powers*.
- Fara, M. (2006). "Dispositions". *Stanford Encyclopedia of Philosophy*. Date retrieved: February 25,2009, from <http://plato.stanford.edu/entries/dispositions>.
- Gillies, D. (2000). *Philosophical Theories of Probability*. Routledge: London
- Handfield, T. (2010) "Dispositions, Manifestations and Causal Structure". *The Metaphysics of Powers*. Routledge: London. Ed. Anna Marmodoro
- Harre, R., Madden, E.H.(1975) *Causal Powers a Theory of Natural Necessity*. Basil Blackwell: New Jersey
- Liu, C. (1996) "Potential, Propensity, and Categorical Realism". *Erkenntnis*. Vol 45. pp 45-68
- McKittrick, J. (2003) "The Bare Metaphysical Possibility of Bare Dispositions". *Philosophy and Phenomenological Research*. Vol 66, No. 2. pp 349-369
- McKittrick, J.(2005) "Are Dispositions Causally Relevant?". *Synthese*. Vol. 144. pp 357-371
- Mellor, D.H. (2005) *Probability: A Philosophical Introduction*. Routledge: London
- Prior, E., Pargetter, R., Jackson, F. (1982) "Three Theses About Dispositions". *American Philosophical Quarterly*. Vol 19, No. 3 pp 251-257
- Popper, K. (1956) *Realism and the Aim of Science*. Rowmand and Littlefield: New Jersey
- Skirms, B. (1980) *Causal Necessity*. Yale UP: Boston

Suarez, M. (2008) "Quantum Propensities". *Studies in the History and Philosophy of Modern Physics*, No. 38,
pp 418-438

Curriculum Vita

Alejandra Olivas-Davila was born in Chihuahua, Chihuahua, Mexico in 1984. She graduated there from high school and moved to El Paso to attend the University of Texas at El Paso when she was awarded a full scholarship by the state government of Chihuahua. While pursuing a BA in Political Science, she minored in Philosophy which lead her to choose the later one as an MA. She presented and commented philosophical papers for the New Mexico West Texas Society meetings. She was one of the founders and president of the UTEP chapter of Amnesty International. She was president fo the Philosophy Club at UTEP. She also worked as a teaching assistant for the Philosophy department under different professors. She was a panelist for the Women’s Conference of El Paso as well as an invited moderator and panelist for the 2009 UT Human Rights Conference. She has been part of the Philosophy of Physics Research Group which provided her with many insights contained in this thesis. She has been teaching assistant and instructor for the Logic class at the University of Texas at El Paso. Being awarded again a full scholarship by the state government of Chihuahua, in the fall of 2008 she entered the MA program in Philosophy at the University of Texas at El Paso.

Permanent Address: 700 Upson,
El Paso 79902

This thesis was typed by Alejandra Olivas-Davila