

Dispositions & Token Identity

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I. Dispositions

What are dispositional properties? They are *latent* or *occult* properties, such as poisonousness, solubility, fragility, and flammability. At least some dispositional properties have

Causal Bases Those categorical properties that are causally efficacious in the disposition's manifestations.

Here are two examples:

Elasticity An elastic rubber band has some property (having polymer chains) that is causally efficacious in the band's deforming reversibly under stress.

Flammability A safety match has some property (being partly composed of potassium chlorate) that is causally efficacious in the match's igniting under friction.

II. The Identity Theory

What is the relationship between dispositions and their causal bases? According to

The Identity Theory Dispositions are identical to their causal bases.

Historical proponents include Quine (1960) and Armstrong (1968, 1973). Contemporary proponents include Mumford (1998), and Heil (1999, 2004). Why accept the identity theory? One reason derives from the

Causal Identity Principle Two properties P, P' are the same property just in case P and P' bestow the same causal role to their bearers.¹

Letting 'D' denote dispositional properties, and 'C' categorical causal bases, the argument runs as follows:

- 1 For all D , D bestows some causal role R .
 - 2 For all D there exists some C , such that C bestows R .
 - 3 If D bestows R and C bestows R , then $D = C$.
- therefore
- C For all D , there exists some C , such that $D = C$.

III. Multiple Realisation

If 'dispositions' and 'causal bases' denote *types*, then the identity theory is false, due to the problem of multiple realisability. More precisely, due to

Distinct Realisation A disposition D is distinctly realised just in case there exists two distinct entities, x_1 and x_2 , such that Dx_1 and Dx_2 , and the causal basis for $Dx_1 \neq$ the causal basis for Dx_2 .

For example, flammability is in safety matches realised by the property of having potassium chlorate, but in distinct matches the flammability is realised by distinct chemicals. Similarly, an elastic metal may be elastic in virtue of its possessing not polymer chains, but atomic lattices.

Because there is distinct realisability, a *reductio* may be run.

A1 If P bestows R and P' bestows R , then $P = P'$

A2 D bestows R , and R is bestowed by C_1

A3 D bestows R , and R is bestowed by C_2

A4 $C_1 \neq C_2$

1 $D = C_1$ (A1, A2)

2 $D = C_2$ (A1, A3)

3 $C_1 = C_2$ (1, 2, transitivity of '=')

4 $(C_1 = C_2) \& (C_1 \neq C_2)$ (A4, 3)

IV. The Token Retreat

Faced with multiple realisation, what's an identity theorist to do? Here are three options:

Option 1 Argue that dispositions occupy *partial* causal roles.²

A2* D bestows R , C_1 bestows R_1 , and $R \subset R_1$

A3* D bestows R , C_1 bestows R_2 , and $R \subset R_2$

Option 2 Deny the datum: there is no multiple realisability.

A2** D_1 bestows R_1 , and R_1 is bestowed by C_1

A3** D_2 bestows R_2 , and R_2 is bestowed by C_2

Option 3 Take the *token identity retreat*.

The monist wants to say that there is just one attribute of x , or state that x is in, that makes it true of x that Dx and that Cx . This requirement can be satisfied even if the extensions of D and C do not coincide. Thus there need not be an identity of universals for monism. [...] each instance of a disposition is identical to some instance of a categorical base [this] amounts to a token-token identity theory.³ (Mumford, 1998, p. 159)

Armed with a token individuation principle:

Token Causal Roles Two property instances $Px, P'y$, are the same property instance just in case $x = y$, Px is concurrent with $P'y$, and Px and $P'y$ bestow the same token causal role R .

We may run a 'token token' analogue of the argument:

- 1 For all Dx , Dx bestows some token causal role R .
 - 2 For all Dx there exists some Cx , such that Cx is concurrent with Dx and Cx bestows R .
 - 3 If Dx is concurrent with Cx and both Cx and Dx bestow R , then $Dx = Cx$.
- therefore
- C For all Dx , there exists some Cx , such that $Dx = Cx$.

V. Plural Realisation

I start by arguing that token-token identity theories do not avoid the problem of multiple realisability. One *bad* argument employs:

Variable Realisation A property P is variably realised just in case there exists an entity x , such that Px at t_1 and t_2 , and the causal basis for Px at t_1 is C_1 , but the causal basis for Px at t_2 is C_2 , such that $C_1 \neq C_2$.

Such cases are not compelling:

¹See (Alston, 1971), (Lewis, 1972), (Shoemaker, 1980), and (Armstrong, 1978a).

²See (Shoemaker 1979; 1980; 1981; 2007)

³See also (Armstrong, 1968).

Reason 1 Property instances are *temporally individuated* (in part at least).

Reason 2 Even accepting token-persistence, variable realisation occurs only given change of bases across time. The token identity theorist will insist that there is only the appearance of a property persisting.

Consider now:

Plural Realisation: A disposition D is plurally realised just in case there exists an entity x , such that Dx , and the causal basis for Dx is both C_1 and C_2 , such that $C_1 \neq C_2$.

Here is a purported example:

Even in the same material, the same disposition may have more than one ground. A piece of cloth may absorb water in two ways, by the water being taken into the individual fibres and by its being held in spaces between the fibres: its absorbency then has two different bases, the molecular structure of the fibres and the larger-scale structure in which those fibres are spun and woven. (Mackie, 1972, p. 148)

Mackie's case may be ersatz. But consider:

Overkill A vial of poison contains a mixture x of two chemicals, $DEATH_1$ and $DEATH_2$. Because of this, x has the disposition to kill when ingested.

An analogous *reductio* may be run:

A5 If Px and $P'x$ are concurrent and bestow the same token causal role R , then $Px = P'x$

A6 Dx and C_1x are concurrent and bestow R

A7 Dx and C_2x are concurrent and bestow R

A8 $C_1x \neq C_2x$

5 $Dx = C_1x$ (A5, A6)

6 $Dx = C_2x$ (A5, A7)

7 $C_1x = C_2x$ (5, 6, transitivity of '=')

8 $(C_1x = C_2x) \& (C_1x \neq C_2x)$ (A8, 7)

VI. Objections & Replies

i. Complex Bases

Conjunctive Basis?

x 's poisonousness = $(DEATH_1 \& DEATH_2)$

No! Some plurally realised dispositions have *disjunctive bases*:

Disjunctive Basis A disposition Dx is disjunctively realised just in case it has two bases C_1x , C_2x , such that the manifestations of Dx are in some cases caused by C_1x and not C_2x , in other by C_2x and not C_1x , and in all other cases (if any remain) by both C_1x and C_2x .

Disjunctive realisation is possible because distinct bases of the same dispositional property may differ in their conditions of *masking*, i.e., the conditions under which the basis is rendered inefficacious. Consider:

Resistance-1 Jones ingests x . Jones is perfectly resistant to $DEATH_2$. Unfortunately, Jones is not at all resistant to $DEATH_1$, and thus as a result of ingesting x , Jones dies.

Resistance-2 Smith ingests x . Smith is perfectly resistant to $DEATH_1$. Unfortunately, Smith is not at all resistant to $DEATH_2$ and thus as a result of ingesting x Smith dies.

Now consider:

Conjunctive Causes If $(Px \& P'x)$ bestows a causal contribution c in a case α , then Px bestows part of c in α and $P'x$ bestows part of c in α .

The vial's poisonousness is efficacious in both cases. Yet by *Conjunctive Causes*, the conjunctive property is causally inefficacious in both cases. So the vial's poisonousness is non-identical to the conjunctive property.

Disjunctive Basis?

x 's poisonousness = $(DEATH_1 \vee DEATH_2)$

Reply A. Disjunctive properties are as suspect as can be. (Heil states that 'disjunctive property' is an oxymoron.⁴)

Reply B. Disjunctive properties are causally inefficacious (thus, no causal identity may be achieved).⁵

Reply C. Motivation to move to the token level is lost. If we accept disjunctive tokens, we need an independent motivation to reject disjunctive types.

ii. Multiple Token Dispositions

Two tokens of the same type?

x 's poisonousness₁ = $DEATH_1$

x 's poisonousness₂ = $DEATH_2$

Reply A. This results in a commitment to *piling*.⁶ Piling is standardly taken to be a bullet to bite (and only permitted in accord with the eleatic principle).

Reply B. If $DEATH_1$ and $DEATH_2$ are identical to the respective (piled) properties, then it should follow that $DEATH_1$ and $DEATH_2$ are piled. But $DEATH_1$ and $DEATH_2$ are not piled! So there is no piling of the dispositions.

Two (or three) tokens of distinct types?

x 's poisonousness₁ = $DEATH_1$

x 's poisonousness₂ = $DEATH_2$

x 's poisonousness₃ = $(DEATH_1 \& DEATH_2)$

I will offer an argument designed to show that there are at least some disjunctively realising bases that genuinely do base the same disposition. It runs as follows.

1. Dispositions are individuated by their manifestations.⁷

2. Some sparse disjunctively realised properties bear bases that differ with respect to their masking conditions, but not with respect to their manifestations.

C. Some distinct disjunctively realisable properties base the very same sparse dispositional property.

Support for premise 2: *E Coli* (*Escherichia coli*) may change its resistance properties over time, whilst *not* changing in its mechanism of manifestation (i.e., the production of *shiga toxins*).

iii. Two Final Worries

Worry 1 The first premise is false: dispositions are individuated in part by their stimulus conditions, and are thus of a finer grain.⁸

Worry 2 Even *E Coli* is insufficiently sparse.⁹

Reply In either case *there is no distinct realisation*. So there is no motivation to move from the type to the token level. The appropriate response is to deny identity, or deny multiple realisability.

⁴(Heil, 2003, p. 40).

⁵See (Lewis, 1986), (Armstrong, 1978a), and (Audi, 2013).

⁶(Armstrong, 1978b).

⁷For defence, see Molnar (2003), Lowe (2011), Vetter (2014).

⁸See (Martin, 2007, pp. 89-91).

⁹See (Bird, 2007).

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