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From Translations to Truthmakers

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My metaphysics owes much to David Armstrong. His work has always influenced mine even when we disagree, as what follows will illustrate by relating my views of truthmaking and the mind to those in *A Materialist Theory of the Mind*.

1. Translations

Quine 1948 argues that 'in debating over what there is, there are still reasons for operating on a semantic plane' (p. 16). And so, up to a point, there are: we can hardly tell if neutrinos or unicorns exist without knowing roughly what we mean by 'neutrino' and 'unicorn'. But there is more to ontology than semantics. For a start, the semantically trivial equivalence principle

(EP) 'P' is true if and only if (iff) P

can hardly settle our ontology. As Dyke 2008 notes, the truism that

'Eating people is wrong' is true iff eating people is wrong (p. 5)

can hardly make the truth of 'Eating people is wrong' entail the existence of moral properties: the anti-realism of Ayer 1946, the error theories of Mackie 1977, and the naturalism of Foot 1978, are not so easily refuted. And it must take more than the truism that

'The sun is a star' is true iff the sun is a star

to make the truth of 'the sun is a star' refute those who 'don't really believe in astronomy except as a complicated description of part of the course of human and possibly animal sensation' (Ramsey 1925, 249).

Perhaps we can give semantics more ontological clout by using a suitable translation of 'P' to say when it's true. 'Suitable' must of course exclude trivial translations into other languages, like

'The sun is a star' is true iff die Sonne ist ein Stern,

which tells us no more about what there is than its all-English equivalent. More promising perhaps are the translations Quine 1948 invokes to avoid unwanted 'ontological commitments', for example to abstract entities like species:

> … when we say that some zoological species are cross-fertile we are committing ourselves to recognizing as entities the several species themselves … until we devise some way of so paraphrasing this statement that the seeming reference to species … was an avoidable way of speaking (p. 13).

This test is not trivial, since it may fail: possible paraphrases may all share the original's unwanted commitments or lack wanted ones. Nominalists, for example, cannot paraphrase 'Red is a colour' as 'Necessarily, all red things are coloured', since (a) this doesn't imply that red things resemble each other in colour and (b) all red things are also necessarily extended and shaped (Jackson 1977, 89–90). But even if 'Red is a colour' had a credible nominalistic paraphrase, Quine's test also needs an independent 'argument for preferring the ontological commitments of [the] paraphrase to those of the original sentence' (Dyke, 86) – an argument the paraphrase's mere existence does not provide. Failing such an argument,

'Red is a colour' is true iff, necessarily, all red things are coloured

would, even if true, be no help to nominalists.

2. Truth conditions

We can put the point just made in terms of Tarskian truth conditions. Tarski 1944 uses these to protect 'object languages' from the Liar and other paradoxes by deporting their semantic predicates, like 'true' and 'false', into meta-languages that we can then safely use to say when sentences of their object-languages are true. But doing this does not require a meta-language's *non*-semantic predicates to differ from those of its object language. Yet unless some do, a meta-linguistic statement of a sentence's truth conditions, like

'Red is a colour' is true iff red is a colour

merely instantiates the trivial equivalence principle (EP). For a sentence's truth condition to be ontologically informative, it must at least use a non-trivial paraphrase, as

'Red is a colour' is true iff, necessarily, all red things are coloured,

would do if it was true, that also has an ontological authority its object-language equivalent lacks. That is why, even then, it would take a different, non-semantic, argument for nominalism to justify replacing 'Red is a colour' with 'Necessarily, all red things are coloured' as a less ontologically committing surrogate.

In any case, realism and nominalism, as doctrines that apply equally to all natural properties, tell us nothing specifically about colours. But some truth conditions for '*x* is red', '*x* is green', etc., do, because part of what we mean by colour terms is that they apply to a way things look to us. So non-colour-blind people can learn what they mean by learning to recognise the looks of things that make us call them – and their looks – 'red', 'green', etc. That is a semantic fact we can then express by saying, of any *x* made visible by the light it reflects, that

'*x* is red' is true iff *x* looks red in daylight to non-colour-blind people,
'*x* is green' is true iff *x* looks green in daylight to non-colour-blind people, etc.

This may not tell us much about the features of things, light, and our eyes, that makes some things (look to us) red and others green. But it does tell us something, by setting a condition which answers to that question – e.g. about how surfaces reflect light of various visible frequencies – must meet.

Simpler, and more applicable here, is the fact, exploited by pressure cookers, that the boiling point of water, as of other liquids, increases with its pressure, as shown in Figure 1:

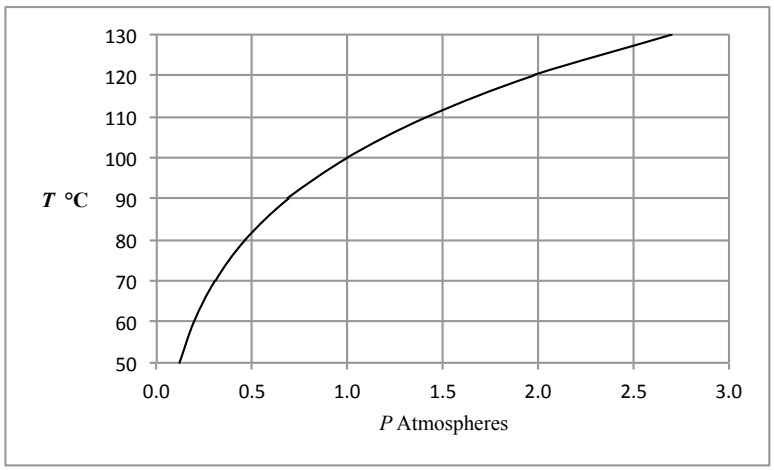

Figure 1: Boiling Point of Water

Thus, if T_P is water's boiling point under pressure P, and P_T is the pressure under which water boils at temperature T, water will boil iff its temperature T and pressure P are such that T is no less than

T_P or, equivalently, that P is no greater than P_T. This gives us the following two truth conditions for any sample x of water:

> 'x boils at T' is true iff x's pressure $P \leq P_T$, and
> 'x boils at P' is true iff x's temperature $T \geq T_P$,

If these too hardly give us the full facts about water and other liquids that fix their boiling points – e.g. their molecular structures – they do set a condition which those facts must meet. That itself is a non-trivial fact about liquids.

3. Dispositions

Restating our truth conditions for 'x boils at T' and 'x boils at P' in terms of dispositions as

> x is disposed to boil at T iff its pressure P is no greater than P_T, and
>
> x is disposed to boil under pressure P iff its temperature T is no less than T_P

may make their ontological implications clearer to us, if not to Ryle 1949, for whom

> dispositional statements are neither reports of observed or observable states of affairs nor yet reports of unobserved or unobservable states of affairs (p. 125).

However, the incredible implications of Ryle's view, e.g. that

> two seemingly identical glasses of which just one is fragile really are identical while they are not being dropped. No event, with possible causes and effects, makes a glass become, or cease to be, fragile (Mellor 1974, 108),

has made me, like Armstrong, a realist about dispositions (1974; 2000) for whom, therefore, dispositional statements can have ontological implications.

My realism about dispositions does not, however, extend to Armstrong's view that

> to speak of an object's having a dispositional property entails that the object is in some *non-dispositional* state or that it has some property (there exists a *categorical basis*) which is responsible for the object manifesting certain behaviour in certain circumstances, manifestations whose nature makes the dispositional property the dispositional property that it is (Armstrong 1993, 86; *my italics*).

Armstrong's dispositional/categorical dichotomy has been rejected by others too, on various grounds (Armstrong *et al.* 1996) not all of which I accept. My objections to it are in my 1974, §5, and 2000, §4, where I argue that dispositions need *no* non-dispositional bases to be 'categorical', i.e. real, properties. Take for example inertial mass, as defined by Newton's laws of motion (Newton 1713 vol. 1, 13). These laws entail that the inertial mass Mx of any solid object x, any net force Fx applied to it, and x's consequent acceleration Ax, will satisfy

$$Mx = Fx/Ax$$

(provided M, F and A are measured in consistent units, e.g. kilograms, newtons, and metres/second^2). This makes Mx a many-valued function of Fx and Ax, just as we saw in §2 that water's boiling or not is a two-valued function of T and P. And just as that function entails the two dispositions given in §2, so Newton's function entails that

> x is disposed to accelerate at A when any net force F is applied to it iff its mass M is F/A, and
> x is disposed to accelerate at A when its mass is M iff the net force F applied to it is A/M.

But if we now ask, as in §2, what property or properties of a solid object x gives it all these dispositions, the only possible answer is: its inertial mass. That dispositionally-specified property

just *is* the property 'responsible for the object manifesting certain behaviour in certain circumstances', in this case the rate and direction in which any net force will accelerate it.

4. Truthmakers

That a *single* property is responsible for all these independent 'manifestations' of inertial mass is an even more striking ontological fact about solids than the existence of boiling points is about liquids. It explains the myriad and otherwise inexplicable coincidences entailed by the fact that

$Mx = Fx/Ax$

quantifies over infinitely many different directions and forces. It explains them by making '*x* has mass *Mx*' entail every conditional of the form

F accelerates *x* at *A* iff *nF* accelerates *x* at *nA*,

in every direction, and for every *F*, *x*, and real *n* for which *nF* doesn't alter *Mx* (e.g. by knocking bits off *x*.)[1] An object *x*'s inertial mass *Mx* is what makes all these logically independent and infinitely numerous conditionals true (or, if you prefer, truth-preserving): it is their *truthmaker*.

Carnap 1936–7 gave a different counter-example to Armstrong's dispositional/categorical dichotomy decades before Armstrong asserted it:

> The intensity of an electric current can be measured … by measuring the heat produced in the conductor, or the deviation of a magnetic needle, or the quantity of silver separated out of a solution, or the quantity of hydrogen separated out of water etc. We may state a set of bilateral reduction sentences,[2] one corresponding to each of these methods. The factual content of this set is not null because it comprehends such sentences as e.g. 'If [a] the deviation of a magnetic needle is such and such then [b] the quantity of silver separated in one minute is such and such, and *vice versa*' which do not contain the term 'intensity of electric current', and which obviously are synthetic (p. 56).

Each constituent – e.g. [a] and [b] – of Carnap's synthetic conditionals specifies a natural property, namely the intensity *I* of an electric current *e* such that

e is *I* iff [a] *e* is disposed to make a magnetic needle deviate by *N* degrees;
e is *I* iff [b] *e* is disposed to separate *M* grams of silver per minute from a solution.

But it is only because both conditionals specify the *same I* that, as Carnap says, they entail that

> if [a] the deviation of a magnetic needle is *N* then [b] the quantity of silver separated in one minute is *M*, and *vice versa.*

And similarly for all Carnap's other conditionals: their all specifying the same intensity *I* is what makes the fact that a current *e* has that intensity the truthmaker for all of them.

In these as in other cases the more independent dispositional specifications a theory can use to identify a single property, the more conditionals instances of that property will make true, and the more therefore the theory will explain. Thus adding Carnap's '[a] iff [b]' to Maxwell's electromagnetic theory (1873) enables that theory to explain the phenomena of electrolysis by taking the intensity *I* of a current *e* to be the truthmaker for

e is disposed to separate *M* grams of silver per minute from a solution.

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[1] Those who deny that conditionals have truth values may read 'S entails C', where C is 'If A then B' and S, A and B are not conditionals, as 'Necessarily, C preserves truth if S is true'.

[2] Carnap's reduction sentences are material conditional readings of what I call dispositional specifications.

Similarly, the identification of the *inertial* mass of objects, defined as above, with their *gravitational* mass, enabled by

> the existence of a field of force, namely the gravitational field, which possesses the remarkable property of imparting the same acceleration to all bodies (Einstein 1923, 114),

allows the general theory of relativity to explain gravitational phenomena, not by gravitational forces, but by making the masses and spatiotemporal relations of objects the truthmakers for truths about the variable curvature of spacetime, which then determines how objects move under gravity.

Yet the truth of neither of these theories, of electrical and gravitational phenomena, requires the dispositionally-specified property that provides its truthmakers to have a non-dispositional basis. Why then require other dispositions to have them? Why, in particular, require the dispositionally-specified beliefs and desires that cause our actions to do so?

5. Functionalism

It is a truth universally acknowledged that we mostly do what we believe will get us what we want. Suppose for example I go straight to my pub because I come to believe it's open and want a drink. That belief and that desire cause me to go by being what Mackie 1965 calls 'INUS conditions'[3] of my action: that is, causes each of which needs the others to make it necessary and sufficient for its effect. These two causes of my going to my pub are not of course its only INUS conditions: two others are that I am physically able to get to my pub, and that I believe it has the drink I want. But if all my going's other INUS conditions, whatever they are, are met, then whether I go becomes a function of whether I desire a drink and whether I believe that my pub's open, just as whether water boils is a function of its temperature and pressure. And just as that function can be restated as two dispositions, so can this one:

> I am disposed to go straight to my pub when I want a drink iff I believe my pub's open;
> I am disposed to go straight to my pub when I believe it's open iff I want a drink.

These dispositions do not of course suffice to distinguish this belief and desire from all my other beliefs and desires, if only because many of those – e.g. my belief that I have enough money to buy my drink – are also INUS conditions of my action. But they do tell us something about the two states of mind they cite; and the wide range of actions that these mental states would make others cause tells us more. If for example I believe I need more money, the belief that my pub's open will dispose me to go to it not straight but *via* a cash point; if I don't want anything from my pub, believing it's open will not dispose me to go to it at all; and so on. Many other beliefs and desires will make any one belief or desire give me, or deprive me of, quite different dispositions.

And besides all the behavioural dispositions our beliefs and desires give us, we have their interactions (e.g. believing my pub's open causing me to want a drink), and the perceptual causes of our beliefs (e.g. seeing someone walk into my pub causing me to believe it's open). Between them, the causes, interactions and behavioural effects of our contingent beliefs and desires may even suffice to identify all of them. The thesis that they do is the functionalism which Braddon-Mitchell and Frank Jackson (2007, ch. 3) call 'common sense' or 'analytic' but I, for obvious reasons, prefer to call 'causal'. It is an application to mental states of an extended version of the thesis that

> what makes a property the property it is, what determines its identity, is its potential for contributing to the causal powers of the things that have it (Shoemaker 1980, 234).[4]

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[3] Mackie defines an INUS condition as 'an *insufficient* but *necessary* part of a condition which is itself *unnecessary* but *sufficient* for the result' (p. 34).

[4] This, *pace* Shoemaker (§§7–9), does not entail his further claim, fortunately irrelevant to what follows, that 'all of the causal potentialities of a property are essential to it' (p. 240). See Mellor & Oliver 1997, 30–31.

It is also a natural extension of Armstrong's thesis that

> the concept of a mental state is primarily the concept of *a state of the person apt for bringing about a certain state of behaviour*. Sacrificing all accuracy for brevity, we can say that, although the mind is not behaviour, it is the *cause* of behaviour. In the case of some mental states only they are also *states of the person apt for being brought about by a certain sort of stimulus* (1993, 82, *his italics*).

6. Physicalism

But if causal functionalism is true, and we can distinguish beliefs and desires by their behavioural effects, perceptual causes and mutual interactions, why go on to identify them with 'physico-chemical states of the brain' (Armstrong 1993, 90)? Armstrong's answer is that these brain states are the non-dispositional states that *cause* the behaviour he uses to define mental states: hence his materialism. And despite denying that dispositions need non-dispositional bases, I could still give his answer, if not for his reason. For if properties like mass and the intensity of electric currents can be identified by their 'potential for contributing to the causal powers of the things that have [them]', as we saw in §4 they can, so can 'physico-chemical states of the brain'. And if currents can have the wide range of effects listed in §4, as they do, why can those brain states not have all the 'behavioural effects, perceptual causes and mutual interactions' of our beliefs or desires?

Two well-known facts about our beliefs and desires may further motivate their identification with brain states. If I believe it's daylight because I can see it is, the light that causes my belief must do so by affecting my eyes, optic nerves, and thence my brain; and similarly, *mutatis mutandis*, when our other senses cause beliefs. We know too that the external behavioural effects of our beliefs and desires require bodily intermediaries: *pace* Uri Geller, we can only bend spoons by first moving our muscles. Are not these facts best explained by identifying beliefs with the brain states that perceptions cause, and which in turn cause the bodily mechanisms of our behaviour?

I say not, but not because I am a dualist. My objections to identifying beliefs and desires with brain states are not objections to physicalism, as is shown by their applying equally to the theory that the temperature *Tx* of any gas sample *x* is the mean kinetic energy of *x*'s molecules (Kripke 1971). Of the reasons given in my 2000, §§9–10, for rejecting this inexplicably popular theory, the most obviously applicable here is that

> there is in reality no property of *mean* kinetic energy to identify temperature with, any more than there are in reality the 2.4 children that average families have: there are only the actual kinetic energies of individual molecules, whose mean value is what the kinetic theory relates to a gas's temperature (p. 93).

This makes temperature and kinetic energy properties of different things: the former of gas samples, the latter of gas molecules. And even if mean kinetic energy *was* a property, of groups of molecules as well as of single ones, it would still not be co-extensive with temperature. For if it was, then when a single molecule of a gas sample at room temperature happens to be at rest (e.g. while bouncing off another molecule), with zero kinetic energy, it would be at absolute zero, which it isn't; and speeding it up would automatically heat it up, which it won't. Yet unless temperature and mean kinetic energy *are* coextensive, as inertial and gravitational mass are, they cannot be identical, on pain of contradiction: nothing can simultaneously both have and lack a single property.

But then, *pace* Kripke, no version of kinetic theory ever said that temperature and mean kinetic energy were *identical*, any more than the simple gas law,

$$Tx = kPxVx,$$

says the temperature *Tx* of a gas sample *x* is *identical* to some combination of *x*'s pressure *Px* and its volume *Vx*: that would be nonsense. All the gas law says is that *Tx*'s *value* is proportional to a

function (the product) of the *values* of *Px* and *Vx*. Similarly, all a deterministic kinetic theory says is that *Tx*'s value is proportional to the value of a function (the mean) of the kinetic energies of *x*'s molecules. That theory may be false – it is – but not because it identifies two demonstrably distinct properties: it doesn't.

That is why our beliefs and desires differ from our brain states: they too are properties of different things. The former are properties of people (Strawson 1959, ch. 3.5), and the latter of our brains or, rather, of the varying congeries of brain cells on which, as we have seen, each of our varying beliefs and desires depends causally at any one time. And that is all Armstrong's theory of the mind need, and should, assert: not that a given belief or desire *is* a brain state, but that whether we have it or not is a two-valued function of the properties and relations of our brain cells, just as whether water boils is a two-valued function of its temperature and pressure. So understood, Armstrong's theory, like the kinetic theory of gases, may be false, but not because it asserts demonstrably false identities between properties of different things.

7. Beliefs and desires

Yet if beliefs and desires, if not identical to brain states, are still functions of them, the question asked in §6 re-arises: if brain states can have all the 'behavioural effects, perceptual causes and mutual interactions' of beliefs and desires, why postulate the latter at all?

The answer is that we need these mental states to provide truthmakers for truths about what we believe and desire. We need them even if Armstrong (e.g. 2003, 13) is wrong to hold that all truths need truthmakers, as I argue he is in Mellor 2009, §8, where I endorse the 'moderate' truthmaker theory, of Heil 2000 and others, that

> only some truths, the primary ones, have truthmakers, while other truths and falsehoods are derivable from the primary truths by means of truth conditional semantics (Forrest and Khlentzos 2000, 3).

For even this moderate theory will still require contingent truths about what we believe and desire to have truthmakers, since they are not entailed by primary truths. That's because, with a few debatable Cartesian exceptions (like 'I exist'), for no contingent P, or fallible human *x*, is '*x* believes P' or '*x* desires P' a complete truth function of 'P'. My pub's being open does not entail that I believe it is, or believe it isn't, or that I want it to be open, or want it not to be; nor do any of those beliefs and desires follow from my pub's being shut.

More to the present point, no truths about what we believe or desire at any one time are entailed by truths about the brain states of which, at that time, they happen, contingently, to be functions. That is not just because those functions are contingent on biochemical laws. Suppose believing my pub's open makes me want to go there, even if in the end I stay at home. That causal link itself depends on my other beliefs and desires: for example, on my wanting a drink and believing my pub has the drink I want. So the belief that my pub is open is only what in §5 I called an INUS condition of the desire it causes, just as it is of the actions it causes. But then the brain state of which my belief is a function can also only be an INUS condition of the state of which the desire it causes is a function: the causal link between those brain states will be contingent on many other such states. And similarly for every other causal link between the brain states of which our constantly varying beliefs and desires are functions. But then which of these states *is*, at any time *t*, the one a given belief or desire is a function of will depend on which other brain states it is causally linked to at *t*.

This is why 'I believe my pub is open' and 'I want to go there' *cannot* be made true by my brain states: for no suitably causally connected values of *B* are they entailed by 'I am in brain state *B*'; and similarly for all other truths about what we believe and desire. Those truths can only be made true by our having those very beliefs and desires. And why should that *not* be what makes these

truths about our beliefs and desires true, when every true '*x* has mass *Mx*' is made true by *x*'s having mass *Mx*? That after all we saw in §§3–4 to be more than a trivial application of §1's

(EP) 'P' is true iff P

since it embodies the striking and contingent fact that a single property of *x*, its mass *Mx*, gives *x* all the logically independent dispositions, to make different applied forces cause it to accelerate differently, which are entailed by the law that

$Mx = Fx/Ax$.

It is an equally striking and contingent fact about us, that a single property – a belief or desire – gives us so many logically independent dispositions, by making other beliefs and desires cause us to to act in so many different ways. That is what makes our beliefs and desires, and not any of our brain states, truthmakers for the truths, about what we believe and desire, which explain our behaviour. And while this is not a conclusion David Armstrong would endorse, it is still one I could not have reached without his work. For that, as for much else, I remain deeply indebted to him.

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