SAMPLE ESSAY 2: PHILOSOPHY & SOCIAL SCIENCE (1ST YEAR)

Before you read the essay …

The topic of this essay is scientific explanation. Here's a bit of background (though this is all also explained in the essay). A lot of the time, scientists are aiming to explain *why* certain phenomena have occurred: why is the climate changing? Why does the sun's position in the sky change during the day? Why did the bridge collapse? And so on. But what *is* it (and this is the essay question) to give a scientific explanation of some phenomenon?

The classic account is the 'deductive-nomological' (or 'D-N') model of explanation. According to the D-N model, explaining a phenomenon is a matter of subsuming it under a 'law of nature' or (in old-speak) a 'lawlike generalisation'. So for example if we want to explain why the bridge collapsed, we need to find some feature F of the bridge, such that *any* bridge with feature F collapses. Our explanation then looks like this:

(P1) The bridge had feature F

(P2) Any bridge with feature F collapses

(C) The bridge collapsed.

Here, (P1) and (P2) together constitute the *explanans* – the explanation of the phenomenon – and (C) is the *explanandum* – the phenomenon we're explaining. You'll see that the above is a *valid argument:* (P1) and (P2) together *entail* (C) (hence 'deductive': you can *deduce* the *explanandum* from the *explanans*). And (P1) is (we may assume) a *'lawlike' universal generalisation* (hence 'nomological', from the Greek 'nomos', meaning 'law'). That's the recipe for a D-N explanation; and the 'D-N model' (or 'covering law' model) of explanation in effect says that *all* bona fide scientific explanations have this D-N form.

So here's the essay …

What is it to give a Scientific Explanation of Something?

Science and its findings are given through scientific explanations. Scientific explanations attempt to show and teach us the reasons why certain phenomena happen. For this, it is important that we know what it is to give a scientific explanation. In this essay I aim to provide an answer to what it is to give a scientific explanation by making the notion of scientific explanation more defined and making it clearer when something isn't a scientific explanation.

Helen 25/10/13 10:20

Comment [1]: This is a little woolly – it doesn't really say very much. It would be better to just cut this paragraph and add a little more content to the next one.

The essay will be structured in three main sections. Firstly, I will explain the basis of my proposal which is the 'deductive-nomological' model. Secondly, I shall demonstrate what I consider to be the most problematic response to this model which concerns the asymmetry of scientific explanation. Finally, I shall demonstrate my addition to the deductive-nomological model which more clearly defines scientific explanation and overcomes the responses to the proposed model. Throughout this essay, the term 'explanation' it is to be understood as the equivalent of 'scientific explanation' unless otherwise stated.

Carl Hempel and Paul Oppenheim (1948, pp 136-140) were the first to propose what is known as the deductive-nomological (D-N) model of scientific explanation. It consists of two parts; the *explanandum* which is the subject of the explanation, and also the *explanans* which are the premises from which the *explanandum* deductively follows. For example, a D-N explanation of why a pan of water is boiling would be as follows.

1. Water boils at 100ºc
2. The water in the pan is being heated at 100 ºc

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3. The water in the pan is boiling

This simple example follows the D-N model of explanation as 1. and 2. are the *explanans* and 3. is the *explanandum*. The form of the D-N model is a sound and deductively valid argument, meaning all the premises (*explanans*) are true but also that the truth of the premises guarantees the truth of the conclusion (*explanandum.*) This shows the deductive nature of the D-N model of explanation. The nomological aspect must also be included within premises.

To satisfy this aspect of the model it is essential to include a universal generalisation as a premise. This universal generalisation must be something which is necessarily true, not

Helen 25/10/13 10:27
Comment [2]: GRAMMAR! A comma is needed before 'which'.

Helen 25/10/13 10:25
Comment [3]: WORD CHOICE. Explain? Outline?

Helen 25/10/13 10:25
Comment [4]: WORD CHOICE. It would be better to say 'asymmetry objection' or similar here – it's not clear which 'responses' are being referred to.

Helen 25/10/13 10:22
Comment [5]: I think we can take this as read – it's not as though issues concerning other kinds of explanations are on the table.

Helen 25/10/13 10:24
Comment [6]: You can miss out the 'pp'! Obviously these are page numbers …

Helen 25/10/13 10:26
Comment [7]: WORD CHOICE. 'has been heated to …'

Helen 25/10/13 10:29
Comment [8]: STYLE. The paragraph break is in the wrong place here. It should be before 'The nomological aspect …', since it's exactly this that the next paragraph is talking about.

Helen 25/10/13 10:46
Comment [9]: GRAMMAR! Should be 'that' and not 'which'. Explained here: www.quickanddirtytips.com/education/grammar/which-versus-that-0

simply an accidental truth. For example, the universal generalisation of water boiling at 100ºc which I used previously is necessarily true, it is law-like. There is no instance where this isn't the case, just like there is no case in which a triangle does not have three sides. However, something which is similarly truthful, such as every pair of shoes that I own is black is only, if true, accidentally true. It's possible for this not to be the case. This is why 'water boiling at 100ºc' can be used to explain why certain water is boiling, yet the latter generalisation concerning the colour of my shoes can't be used to explain why a certain pair of shoes is black in colour.

The D-N model offers key factors when considering what it is to give a scientific explanation of something. To give a scientific explanation of something, we are looking for an explanation which we can guarantee as logically sound. Although science progresses and theories replace previous ones, it is necessary that the findings of science follow logically when assembling them in an explanation. This is a key factor of the D-N model. As a deductive argument a true conclusion is guaranteed if the premises are also true. Therefore, accurate findings in science are able to give us logical explanations due to the structure of the argument in the D-N model.

As well as logical certainty provided by the D-N model, it allows us to reduce explanations into key components. A scientific explanation ought to allow us to understand what is being explained. With the reduction of phenomena into key components and laws, it allows a reduction in theories as there are underlying components which phenomena have in common which can add strength to a theory.

I will now explain the most damaging response to the D-N model. The response I am concerned with is based around the asymmetry of scientific explanation. This is a damaging

Helen 25/10/13 10:51
Comment [10]: Getting into a bit of a philosophical minefield here (and strictly speaking the claim is false – water doesn't boil at 100 degrees at high altitudes!). But it's a first-year essay, and anyway the minefield isn't really relevant to the essay, so we'll let that pass.

Helen 25/10/13 10:52
Comment [11]: GRAMMAR! This isn't a sentence. Should be 'water *boils* at 100 degrees'.

Helen 25/10/13 10:53
Comment [12]: This paragraph is rather woolly – I'm not really sure what the author is saying.

Helen 25/10/13 10:54
Comment [13]: This paragraph is also rather unclear. I'm not sure what 'key components' are.

Helen 25/10/13 10:55
Comment [14]: Good signposting! Really helpful. Though I would say 'objection' rather than 'response'.

response to the D-N model as it uses the logic which makes the D-N model a strong answer to the question of scientific explanation.

The idea of the response is that although we can explain a certain phenomenon through the D-N model, it also allows us to reverse the explanation to explain something which wasn't the object of the original explanation. To show this I will use arguably the most famous example for this objection. Supposing there was a flagpole of which its length was known, and we also knew the angle of the sun over the horizon, we could scientifically explain the length of the shadow given the knowledge that light travels in roughly a straight line. (The fact that light travels in roughly a straight line is our universal law.) Given this law, the angle of the sun and the height of the flagpole we know that this entails the length of the shadow. This therefore explains the length of the shadow. However, once the length of the shadow is known, given that the universal law and the height of the flagpole are known, it follows that we could 'explain' the angle of the sun above the horizon. The height of a flagpole and the length of a shadow obviously can't explain why the sun is at a certain angle and this presents a problem for the D-N model.

Many philosophers believe that this can be rectified by adding a causal condition to the D-N model, as explained by Strevens, '*This explanatory asymmetry mirrors a causal asymmetry; proponents of the causal approach to explanation take this as reason to think causation is the fundamental ingredient of explanation.*' (Strevens, 2004, p.156) However, adding a causal condition adds the necessity of another explanation. If there is a causal condition present in the explanation, there needs to be an explanation of the cause, for which there would need to be another cause and an explanation for it leading to an infinite regression of causes.

Helen 25/10/13 10:57
Comment [15]: Hmm, I *kind* of see what the author is getting at here, but I'm not sure this sentence is really doing any work – it could be deleted.

Helen 25/10/13 10:58
Comment [16]: Not brilliantly put, but again good signposting: tells the reader the basic gist of the objection right at the outset.

Helen 25/10/13 10:58
Comment [17]: GRAMMAR! Should be 'whose'.

Helen 25/10/13 10:59
Comment [18]: STYLE. A 'but' or 'however' would help here.

Helen 25/10/13 11:01
Comment [19]: This is a good paragraph: explains the objection clearly and succinctly.

Helen 25/10/13 11:00
Comment [20]: GRAMMAR! This should be a colon.

Helen 25/10/13 11:00
Comment [21]: STYLE. Never put quotations in italics, unless the original is in italics (which I'm guessing in this case it isn't).

Helen 25/10/13 11:07
Comment [22]: Some more care needed here. In that quotation, Strevens isnt' actually proposing to 'add a causal condition to the D-N model'; he's proposing that causation is '*the* fundamental ingredient of explanation', which sounds more like a rejection of the D-N model all together. Also, what exactly would the 'added' causal condition – i.e. the extra premise in the D-N argument – look like? It would help to spell this out explicitly.

Helen 25/10/13 11:04
Comment [23]: Why is this so? It's not clear. Or, to put it another way, why can't we say just the same about lawlike generalisations? After all, it's not a 'brute', fundamental law that water boils at 100 degrees: there is a chemical explanation for this (and ultimately, presumably, some explanation from physics of the relevant chemical law). If the original D-N account doesn't face an infinite regress here, why does it when we add a causal condition?

To add strength to the D-N model, I propose to add a condition to overcome the asymmetry worries. I propose that a scientific explanation must be coherent with previously explained science. By coherent, I do not mean it must work alongside previous explanations, for if this was the case there would be no scientific progress. (For example, quantum physics isn't coherent with science in Newtonian times.) By coherent I mean that scientific explanation must explain the phenomenon it was targeted at, but not do so in a way that leaves other aspects of previously explained science without explanation. This adds to the D-N approach as when asymmetry worries are present, my additional factor will ensure that the original scientific explanation is a scientific explanation and the secondary, reversed 'explanation' isn't a legitimate explanation.

To demonstrate, I will show how this overcomes the previous asymmetry worries. As explained, we can offer a scientific explanation for the length of the shadow given we know the angle of the sun, the height of the flagpole and the universal generalisation that light travels in a roughly a straight line. However, explaining the angle of the sun from the height of the pole and the length of the shadow wasn't adequate. Its inadequacy can be explained due to my proposed addition to the D-N model.

As my proposal states that to be an explanation it can't leave previously explained phenomena unexplained, the reversed explanation concerning the height of the sun isn't a scientific explanation, therefore removing asymmetry worries of the original explanation as it can't be used to explain other phenomena.

The 'secondary' explanation would mean for the height of the sun to be explained by the height of the flagpole, the flagpole would be a requirement in all explanations concerning the height of the sun (just as the height of the sun is a feature of all explanations concerning the length of the shadow.) It clearly isn't a factor of all explanations concerning this, meaning this explanation would be incoherent with other science and would leave the angle of the sun

Helen 25/10/13 11:08
Comment [24]: It could be made clearer that this is an *alternative* proposal to the one just discussed (adding a causal condition), and not a second addition to the D-N model.

Helen 25/10/13 11:07
Comment [25]: WORD CHOICE. Why 'worries' plural? Don't we have just one worry on the table?

Helen 25/10/13 11:09
Comment [26]: This is really good! The author is making a novel proposal and has done pretty well to explain what it is. (It's not entirely clear from this paragraph alone what the proposal amounts to, but we are about to get an example …)

Helen 25/10/13 11:10
Comment [27]: GRAMMAR! 'given *that* we know …'

Helen 25/10/13 11:10
Comment [28]: WORD CHOICE. 'by', not 'due to'.

(previously explained by other explanations) unexplained. As the secondary 'explanation' doesn't meet the criteria for a scientific explanation this removes any asymmetry to the original explanation and overcomes the original criticism.

This addition not only reduces what counts as explanation, but also prefers explanations which encompass more of science within them. Friedman writes in similar fashion to this: '*Science is global rather than local. Scientific explanations do not confer intelligibility on individual phenomena by showing them to be somehow natural, necessary, familiar, or inevitable. However, our over-all understanding of the world is increased'* (Freidman, 1974, p.18) This global aspect links explanations and protects against explanations simply adding to individual phenomena and circumstances whilst not accounting for others.

In conclusion, this essay provides an addition to the original D-N model. By using this as a base, presenting its chief response and also by refuting this response by addition, I have added to the definition of a scientific explanation. This means that as a tighter notion and understanding of scientific explanation is available, it's now easier to see that to give a scientific explanation of something is to not only deductively present findings, but to also present them in such a way it allows for other science to be explained.

Word Count: 1580

Helen 25/10/13 11:17
Comment [29]: This is a good attempt at explaining a tricky point – though it could maybe be clearer. I think the idea is that we already have a perfectly good *general* explanation for the height of the sun – in any given case we can explain it by appealing to the relative positions of the sun and the Earth. So to use the length of the shadow on one particular case is (somehow) in tension with that general explanation we already have. (And clearly lengths of shadows don't *in general* explain the height of the sun; e.g. we can still use the above explanation even if it's overcast and there are no shadows.) Or something like that.

Helen 25/10/13 11:18
Comment [30]: WORD CHOICE. This could be phrased better.

Helen 25/10/13 11:18
Comment [31]: WORD CHOICE. This is a bit clunky.

Helen 2/11/13 13:56
Comment [32]: This quotation seems rather spurious to me! There isn't enough background context given to explain what Friedman means, so really the author is just saying 'look, this author mentions the 'global' thing too!'. It would be better to use this space to flesh out the positive proposal outlined above a bit more. (Also, again, the quotation should not be in italics unless the original is.)

Helen 25/10/13 11:20
Comment [33]: This isn't very clear.

Helen 2/11/13 13:48
Comment [34]: Again, this isn't very clear. But the idea behind it is good – the conclusion isn't just reiterating what's happened in the essay (which would be unnecessary because it's clear what the author's argument and conclusion are already), but trying to sum up the virtues of the positive proposal.

Bibliography

Friedman, Michael (1974), "Explanation and Scientific Understanding", *The Journal of Philosophy*, Vol. 71, No.1, pp. 5-19.

Hempel, Carl G**; Oppenheim**, Paul (1948), "Studies in the Logic of Explanation", *Philosophy of Science*, Vol. 15, No. 2, pp. 135-175.

Strevens, Michael (2004), "The Causal and Unification Approaches to Explanation Unified—Causally", *Noûs*, Vol. 38, No.1, pp. 154-176.

Helen 25/10/13 11:24
Comment [35]: Gratuitous use of bold here!

Helen 25/10/13 11:24
Comment [36]: This isn't an *error*, but it would be much cleaner to just say: *The Journal of Philosophy,* 71: 5-19. (NB you don't need to state the issue number ('No.1') – just the volume number.)

GENERAL COMMENTS

This is a good essay!

Thesis and argument: The question asks what it is to give a scientific explanation for something. The author's answer to that question is very clear: the correct account of scientific explanation is the D-N model, modified in the way the author proposes. The argument for that modification is also clear: the major flaw with the D-N model is that it can't deal with the asymmetry of explanation, and the author's proposal (allegedly) fixes that problem better than its main rival (which is adding a 'causal condition' to the D-N explanation).

Originality: The level of originality is good in the second half of the essay, with a novel positive proposal for how to solve the asymmetry problem: excellent! On the other hand, the trawl through the D-N model, the asymmetry problem, and the possibility of adding a causal condition is all on the handouts. (Not plagiarised – the author has put it in his/her own words! But it is really just summarising from the lectures.) The objection to the causal condition doesn't come from the lecture, though, so that's also novel.

Structure: The essay is very clearly structured. It's clear how each paragraph fits into the overall line of argument, and so it's pretty easy to follow the argument through from beginning to end. And the argument is succinctly summarised at the beginning so that the reader knows where the essay is heading.

Knowledge and understanding: No glaring errors and shows a good understanding of the relevant issues.

Writing style: The essay is written in a concise, unfussy style and is therefore mostly fairly easy to understand. No typos! (Or none that I spotted anyway.) There is the occasional minor poor choice of words and the odd grammatical error; but these generally don't affect the reader's ability to understand what's going on.

On the negative side, there are a few bits that aren't very clear – especially where the author is trying to explain his own positive proposal. And the use of quotations isn't very good – they are not performing any obvious function with respect to the author's argument.

Philosophical merit: The author makes a genuine attempt to propose a novel solution to a philosophical problem, so some genuine philosophical thought has gone into this!

On the other hand, he/she could have considered and thought of responses to potential objections. The most obvious objection is that not *all* explanations of the length of a shadow involve appeal to the height of the sun, since shadows can be cast by other forms of lighting (a lamp, the moon, …). So by the author's own proposed standards, we can't after all explain the length of this particular shadow by appealing to the height of the sun – which is a bit of a problem! The essay would have been improved if the author had considered that objection, or perhaps some other possible objection, and thought up a response.

The objection to adding a causal condition was also novel, but, again, not very convincing (see comment-box).

To get a *really* good mark, I think the author could have spent less time explaining the D-N model and setting the asymmetry problem up (after all, this really only demonstrates the ability to summarise handout material) and correspondingly more time articulating and defending his/her own proposed solution to the problem.

And the mark …? I would give this essay a high 2.1.