"Humean Supervenience Debugged" Outline

Introduction

Humean supervience The thesis that the whole truth about a world like ours supervenes on the spatiotemporal distribution of local qualities.

There is one big bad bug: chance. It is here, and here alone, that I fear defeat.

- But Lewis thinks he can now beat the bug. Here's the roadmap:

  1. Reviewing old ground, reintroduce Humean supervenience.
  2. What might a Humean analysis of chance look like?
  3. Why is chance a problem for Humean analyses?
  4. Why are unHumean answers are not acceptable refuge?
  5. The beginning of a solution that plagues the Humean analyses. Why is it not good enough?
  6. The *good news*: How to complete the solution.

The resulting rescue of Humean chance won't give us all we might wish, but I think it gives us enough.

Humean Supervenience

- We may be certain *a priori* that any contigent truth whatever is made true, somehow, by the pattern of instantiation of fundamental properties and relations by particular things.

  - That is, that truth is supervienient on being.
  - If two possible worlds are discernible in any way, it must be because they differ in what things are in them or how those things are.
    * "How things are" is fully given by the fundamental, perfectly natural properties and relations that those things instantiate.

- As an anti-haecceitist, Lewis would drop the "what things there are" clause, instead, *all contigent truth supervenes just on the pattern of coinstatiation.*

  - Some will wish to add other fundamental properties or relations, like:
    * Armstrong's immanent universals.
    * William's families of exactly representing tropes.
  - We may reasonably hope that physics will give the inventory of the perfectly natural properties and relations of this world.

- Humean supervinience is another speculative addition to the thesis that truth supervenes on being.

  - It says that the fundamental relations are exactly the spatiotemporal ones.
  - It says that in worlds like ours, the fundamental properties are local qualities
    * Perfectly natural intrinsic properties of points.
    * Or of point-sized occupants of points.
  - All else supervenes on the spatiotemporal arrangement of local qualities throughout all of history, past, present, and future.

- Humean supervenience is inspired by classical physics, but physics isn't classical anymore.

  - The point of defending Humean supervenience is not to support reactionary physics, but resist the philosophical arguments that there are more things in heaven and earth than physics has dreamt of.

– Lewis is defending the *philosophical* tenability of Humean Supervenience.

- But even classical physics raises a question for Humean Supervenience.

  Is a vector field an arrangement of local qualities?

  – Lewis said that qualities were intrinsic, that means they can never differ between duplicates; and two things can be duplicates even if they point in different directions.

- Humean supervenience is meant to be *contigent*.

  – It says that among *worlds like ours* no two differ without difference in the arrangement in qualities.
  – But when is a world like ours?
    * Lewis used to say: "When it's a world of the 'inner-sphere', free of fundamental properties or relations that are alien to our world."
    * But this probably wont do.
  – On the **Armstrong spinning sphere** or the **Kripke spinning disk**:
    * One *lesson*: One way to get a difference between worlds with the exact same arrangment of local qualities is to have things bilocated in spacetime.
    * Take two worlds containing spheres of homogenous matter, the only difference being that one is spinning.
    * The arrangement of local qualities is just the same.

      The difference between the spinning and the stationary sphere is a difference in the pattern of bilocation.
    * No worries fo Humean Supervenience, because Lewis believes our worlds to be a "temporal-parts-world", and therefore neither of the worlds in the story is like ours.

Symmetry and frequency

Chance and credence

Chance Objective single-case probability. For example, 50% is the probability that a certain particular tritium atom will decay sometime in the next 12.26 years.

Credence Degree of belief, and notably not the same as *chance*.

- But chance is connected to credence: if a rational believe knew that a chance of an event was 50%, then almost no matter what else he might or might not know as well, he would believe to the degree 50% that the event would occur.
- If Humean Supervenience is true, then contigent truths about chance are in the same boat as all other contigent truths.
  – They must be made true by the spatiotemporal arrangement of local qualities.
  – How might this be?
    * The Principal Principle requires that the chancemaking pattern in the arrangement of local qualities must be something that would, if known, correspondingly constrain rational credence.
    * That is, that *whatever makes it true* that the chance is 50% must also be *whatever makes it rational* to believe to degree 50% that the event will occur.

Chance-makers and the indifference principle

- Two candidates for chance-makers: *symmetries* and *frequencies*.

  – On symmetries:

> Suppose a drunkard is wandering through a maze of T-junctions, and at each junction we can find nothing that looks like a relevant difference between the case that he turns left an the case that he truns right. We could well understand if rational credence had to treat the cases alike, for the lack of relevant difference. If the symmetry is something that would, if known, constrain credence, then it is suitable to serve as a chancemaker.

  * The *principle of indifference.*

- An unrestricted principle of indifference is inconsistent.

  – With alternative cases of ingeniously hoked-up properties, you can get it to say anything you like.
  – But assume that you can somehow distinguish between that nonsense and then limit the principle only to natural properties. You get only natural partitions.

Symmetries as chance-makers

- Some *reservations* about symmetries as chance-makers.

  1. There is no reason to think that we have symmetries to underlie the chance phenomena that we there there are.

     It would be nice to think that each tritium atom contains a tiny drunkard in a maze of symmetrical T-junctions.

  2. Symmetries are only defeasible constrainers of rational credence. Therefore, they can only be *defeasible chance-makers.*

     The symmetry of the T-junctions would no longer require 50-50 division of credence if we also knew that, despite this symmetry, the drunkard turns right nine times out of ten.

Frequencies as chance-makers

- Now it looks as though *frequencies* are the *real chance-makers.*

  Frequency A pattern in the spatiotemporal arrangement of qualities.

  – We can well understand how known frequencies could constrain rational credence.

- *Again*, this will be worse than useless if we can't distinguish natural from gerrymandered kinds, and *again*, we could get any answer we liked.

  – But we can do it! And nature has been kind to us.

    Large chance systems seem to be put together out of many copies of very small chance systems; and very small chance system often do come in enormous classes of exact copies. **You see on tritium atom, you've seen them all.**

Problems for frequentism

- Lewis thinks this simple frequency analysis is *near enough right*, but *has limits.*

  – It is only plausible when we do have the enormous classes of exact copies.
  – It has difficulty analyzing **unobtainium**.
    * Consider unobtainium[346].
    * It's hard to make the stuff, in all of space and time there have been only two.
    * One had a lifetime of 4.8 microsecond, and the other a life of 6.1 microsecond.

- Further, consider ubobtainium[349]. The isotope is even harder to make, and there isn't a single instance of it through space and time.

- Its frequency of decay in a given time is undefind, 0/0.
- If there's any *truth* about its *chance* of decay, this undefined frequency cannot be the *truthmaker*.

- The problem of unobtainium may make us think that it's not about *frequencies in the actual world*, but rather *counterfactual situations* where unobtainium is abundant.

- Another **problem** for *simple frequentism*:

  If spacetime is finite and chance system get only just so small, then all frequencies are rational numbers. Yet the great majority of real numbers are irrational, and we have no pre-philosophical reason to doubt that chances in a finite world can take irrational values.

- The **answer** to the *problem of unobtainium* is remembering that single-case chances follow from *general probabilistic laws of nature*.

  - There are general *laws* of radioactive decay that apply to *all atoms*.
  - Unobtainium atoms have their chances of decay *not* in virtue of decay frequencies for unobtainium, but rather in virtue of these general *laws*.

Onwards to laws

- The appeal to laws only postpones the problem of chance.
  - What pattern in the arrangement of qualities makes the chances?
  - So we must now turn to a Humean analysis of laws, and make them probabilistic.

The best-system analysis of law

Improving Ramsey's Best Systems Account

  [Laws are] consequences of those propositions which we should take as axioms if we knew everything and organized it as simply as possible in a deductive system. — Ramsey

- Lewis expands the definition like so:
  - Take all deductive systems whose theorems are true.
  - Some are *simpler*, better *systemiztized* than others.
  - Some are *stronger*, more *informative* than others.
  - These virtues compete: An uninformative system can be very simple and an unsystemiztized compendium of miscellaneous infromation can be information.
    * The best sytem is the one that strikes as *good* a *balance* as *truth will allow* between simplicity and strength.
    * How good this is will depend how kind nature has been.

  A regularity is a law if and only if it is a theorem of the best system.

Some complaints

- Lewis thinks thats Armstrong and van Fraassen are question begging.
  - If you think that theorems of the best system are laws, then you should also think:
    * Underlie causal explanations;
    * Support counterfactuals
    * Are not mere coincidences;

* That they and their consequences are necessary;
* That they are confirmed by their instances.
- Others are more worrying. For instance, like any regularity theory, the best-system analysis says that "laws hold in virtue of patterns spread over all space and time."
    * *If* laws underlie causations, *then* we are wrong to think that causal roles of brain states are an entirely local matter.
    * Unpleasant surprise, but Lewis *bites the bullet.*

The worst problem: standards

- Where do the *standards* of simplicity and strength come from?
    - It *seems* to be from us. But that can't be right!
    - If we don't like the laws of nature, we can chance the laws, and make them always *have been* different, just by changing the way we think!
        * "Positive thinking."
    - Lewis uses to think that *rigidification* solved the problem.
        * That you don't use hypothetical new stands, but rather the actual and present standards.
        * This is *cosmetic only*, Lewis now thinks. It only makes the problem harder to state.
- The **answer**: If nature is kind to us, the problem needn't arise.
    - Simplicity and strength are partly a matter of psychology.
    - It's not because of how we think that:
        * A linear function is simpler than a quartic or step function
        * A short alternation of prenex quantifiers is simpler than a longer one.
    - *If* nature is kind, *then* the best system will be *robustly* best.
        * *If* nature *were* unkind and disagreeing rival system were running neck-and-neck, *then* lawhood might be psychological.
    - This trouble is with unkind nature, not on Lewis' analysis.
        * Cross the bridge when we get there.

Onwards to probabilistic laws

- So far we don't have probabilistic laws.
    - *If* we had chances, *then* we could put them into the axioms of the best system and go about our day.
        * But we don't.

We decided that the chance-making patterns in the arrangement of qualities had to include the lawmaking patterns for the probabilistic laws that determine the chances in all the different cases.

The best-system analysis of law and change together

The solution: fit

- Modify the best-system analysis to make it deliver the chances and the laws in one "package deal."
    - Take all deductive systems that pertain not only history, but also to what the various outcomes are in various situations (like the decay probabilities).
    - Require these system to be true about history.

- – You cannot require anything about chances, because we don't know what that is.
- Some of these system will *fit* the actual course of history better than others.
  - – The chance of that course of history will be higher according to some systems than according to others.
- The **virtues** of *simplicity*, *strength*, and *fit* trade off.
  - – The best system is the system that get the best balance of all three.
  - – But now some of the laws are probabilistic!
    - ∗ We can now analyze chance: "The chances are what the probabilistic laws of the best system say they are."
- Like before, Lewis *hopes* that the best system is far ahead of the rest in terms of how *robust* it is so that the laws aren't dependent on us.
  - – The prospect is best if the the chance events aren't too few or too trivial.

Homogeneity

- In the simplest case, the best-system *reduces to* frequentism.
  - – Suppose all chance events fall into one large and homogeneous class:
    - ∗ to fall silent about the chances of these events would cost too much to strength.
    - ∗ to assign equal single-case chances that differed from the actual probability would cost too much to fit.
  - – We get the best fit by equating chances to the frequency
    - ∗ The larger the class is, the more so.
- Suppose the class isn't very large, and that the frequency is close to a simple value, say 50-50.
  - – *Then* the system assigns uniform chances of 50% exactly gain *simplicity* and doesn't lose too much *fit*.
- Suppose the class is *not homogenous*.
  - – Then, "a system that assigns unequal chances in different subclasses will gain greatly in fit at not too much cost in simplicity."
- This is how we get the decay chances for Un^{346} and even for Un^{349}, in virtue of chancemaking patterns that don't involve decay frequencies for unobtainium itself.
- But this is not epistemology!
  - – *This is how nature determines what's true about the laws and chances.*
- And this version of BSA, we can fix the big bad bug!

Undermining

What is chance undermining?

- *Suppose* we have a Humean analysis which says that present chances supervene upon the whole of history, future, past, and present (but not upon the past and present alone).
  - – *Then* different alternative future histories would determine different present chances.
  - – Further *suppose* that the differences between these alternative futures are differences in the outcomes of present of future chance events.
    - ∗ *Then* each of these futures will have some non-zero present chance of coming about.
- Let F be some particular alternative future, and one that determine different present chances than the actual future does.
  - – F will not come about, since it differs from the actual future.

– But! There is some present chance of F.
  * That is, there is some present chance that event would go in such a way as to complete a chancemaking pattern that would make the present chances different from what they actually are.
– Present chances *undermine* themselves.

An example of undermining

- For *instance*, there is a minute *present chance* that for more tritium atoms will exist in the future than have existed, and each one will decay in only a few minutes.
  – If this unlikely future came to pass, it would complete a chancemaking pattern on which the half-life would be much less than the actual 12.26 years.
    * This is so under both *frequentism* and *best-system account of laws*.
  – Could this come to pass?
    * *Yes*, in the sense there's a non-zero present chance of it.
    * *No*, in the sense that its coming to pass contradicts the truth about present chances.
  – *If* it came to pass, *then* the truth about present chances would be different.
  – It's not that the present changes, but rather it would never have been different.
- This is "no worse than peculiar."

A closer look at the Principal Principle

- The Principal Principle *does* rule out undermining!
  – It was this that led Lewis to despair about the Humean analysis of laws.
- Here's the **contradiction** the Principal Principle leads to. Take some particular time and:
  – Let C be the rational credence function for someone whose evidence is limited to the past and ppresent.
  – Let P be the function that gives the present chances of all propositions.
  – Let A be any proposition.
  – Let E be any proposition that satisfies two condition:
    1. It specifies the present chance of A, in accordance with P.
    2. It gives no "inadmissible" information about future history, that is, no information about how chance events in the present and future turn out.
  – The Principal Principle is therefore:

$$C(A|E) = P(A)$$

  – Now take A to be F, our alternative future history that would yield present chances different from the actual ones.
  – And let E be the whole truth about the present chances as they actually are.
  – Recal that F had some present chance of coming about.
  – So, by the Principal Principle:

$$C(F|E) \neq 0$$
$$C(F|E) = 0$$

No refuge

- It is because some of the pattern lies in the future that there is a possibility that the future could undermine present chances.
  - Of course, it'd go away if we assume the pattern lay entirely in the past.
- But we can't assume this, and here's why:

The Problem of the Early Moment

- There might be a beginning of time, or a beginning of a certain kinds of chancy phenomena go on.
  - What could make the chances at a moment not long after the beginning?

The Problem of Fluctuation

- We usually think that there are laws, and hence regularities, of uniform chances.
  - "All tritium atoms have precisely the same chance of decaying in a given period."
  - It is not to be expected that the different chancemaking patterns in these different segments will all make the same chance of decay.

The Problem of Drift

- Take the two problems together, and you have the *problem of drift.*
  - For simple frequentism:
    * Suppose early on, Js divide 50-50 between Ks and not-Ks, but so far there haven't been many Js together.
    * Then we should *expect* that there might be a chance to be a run of Ks or not-Ks, that would significantly raise or lower the chance of the next J to be a K.
    * Then the chance of being a K would drift to one or zero, and remain there for a long time after.

unHumean

- With all these problems, Lewis thinks his opponents will think he's done all the work for them.
  - So he should just admit defeat.
- But *there is no refuge here for the non-Humean.*
  - Posit all the unHumean whatnots you like, so long as truths supervene on being.
  - But *don't* call any allege features of reality "chance" unless you've already shown that you have something, knowledge of which would constrain rational credence.
    * How could knowledge that two universal stand in a certain special relation $N*$ could constrain rational credence about the future co-instantiation of those universals?
- Unless you *first* convince Lewis that it's a special chancemaking relation, where J has a 50% chance of being K.
  - But you can't just *say* that, you have to *show* that.

The beginning of a solution

- Our *problem* is, where F is an *un-actualized future* that would *undermine* the *actual present chances* given by E, is that $C(F|E) = 0$ because F and E are inconsistent, but $C(F|E) \neq 0$ by the Principal Principle because E specifies that F has non-zero chance of coming about.

    - If that use of the Principal Principle is fallacious, the contradiction goes away.

- That use of the Principal Principle *is* fallacious, *if* the present chances are made by a pattern that extends into the future

    - *Then E* bears inadmissible information about future history.
    - It excludes the future F.
    - Since E is inadmissible, the Principal Principle does not apply.
    - The fatal move that led from Humeanism to contradiction is no better than such obvious blunders:

$$C(\text{coin falls heads}|\text{it is fair and willfall heads } 99/100) = \frac{1}{2}$$

    or even

$$C(\text{the coin will fall heads}|\text{it is fair and will fall heads}) = \frac{1}{2}$$

- *Victory!*
    - What we have just seen is that if chancemaking patterns extend into the future, then any use of the Principal Principle is fallacious.
    - For any proposition that bears information about present chances thereby bears information about future history.

- According to the best-system analysis, information about present chances is inadmissible because it reveals future history.

    - But this information is not inadmissible, as witness the way it figures figures in everyday reasoning about chance and reasoning.
        * *Contradiction.*

The solution completed

- Admissibility admits of degree

    A proposition E may be imperfectly admissible because it reveals something or or other about future history; and yet it may be very nearly admissible, because it reveals so little as to make a negligible impact on rational credence.

- Degrees of admissibility are a relative matter.

    The imperfectly admissible E may carry lots of inadmissible information that is relevant to whether B, but very little that is relevant to whether A.

- Near-admissibility may be good enough.

    If E specifies that the present chance of A is $P(A)$, and if E is nearly admissible relative to A, then conclusion that $C(A|E) = P(A)$ will hold, if not exactly, at least to a very good approximation.

Correcting the Principal Principle

We face a question. If the old Principal Principle applies only as an approximation, what is it an approximation to? How, exactly, is chance related to credence? Can we find a new, corrected Princpal Principle that works exactly when the old one works only approximately?

- Here's a correction applicable only to a special case of the old Principal Principle.
    - Let H_{tw} be the proposition giving the complete history of world w up to and including time t.
    - Let T_w be the complete theory of chance for world w.
        * A proposition giving all the probabilistic laws and therefore all the true history-to-chance conditional that hold at w.
    - Let P_{tw} be the chance distribution at time t and world w.
    - If T_w were admissible, then the conjunction $H_{tw}T_w$ would also be admissible.
        * It would specify the chance at t at w of any proposition A.
    - So we could put it for E in the old Principal Principle.
    - Dropping the subscripts, we have:

        (OP) $C(A|HT) = P(A)$

        * "The credence you should assign to A given the complete history of the world and the complete theory of chance is equal to the probability of A"
    - The correction Lewis favor is:

        (NP) $C(A|HT) = P(A|T)$

        * "The credence you should assign to A given the complete history and complete theory of chance at a world is equal to the probability of A given the complete theory of chance of the world."
    - If T were perfectly admissible, then (OP) would be correct derived as an instance of the old Principal Principle.
- *If* there are undermining futures with non-zero present chance that make T false, *then* T rules out these undermining futures.
    - If so, then:
        1. T and HT are not perfectly admissible.
        2. (OP) is not correctly derived.
        3. (OP) cannot be applied to determine $C(A|HT)$
        4. $P(T) \neq 1$
        5. Exception cases aside, $P(A) \neq P(A|T)$.
    - If so, then accept (NP).
- Conditionalize on T to avoid undermining futures.

Against perfectionism

- The new version of the Principal Principle is better by Humean lights, but the old one is *more intuitive.*
    - So the old Principle is "key to our concept of chance."

Chance can be defined as that feature of Reality that obeys the old Principle, yet chance doesn't quite obey it! Isn't this incoherent?

- *No.*

- – A feature of Reality deserves the name "chance" to the extent it occupies the role of chance.
- – Occupying the role means obeying the old Principle.
- – But undermining means that nothing occupies the role perfectly, so nothing perfectly deserves the name.
- – But near enough is good enough.
- – And if nature is kind, the chances ascribed by the probabilistic laws of the best system will obey the old Principle to a very good approximation.
  - ∗ Therefore, they will occupy the chance role enough to deserve the name.
  - ∗ To deny this would by *silly*.

- Some equivalent silliness:

  - – Nothing deserves the name "sensation" unless it were infallibly introspection.
  - – Nothing deserves the name "simultaneity" unless it were a frame-indepedant equivilence relation.
  - – Nothing deserves the name "value" unless it couldn't possible fail to attract anyone who is well acquainted with it.