Philosophy 148 — Announcements & Such

- HW #4 grades posted (µ = 75). [This one was tougher than I thought.]

- New Plan for HW #5 (owing to my flu)
  - It will be due on the last day of class — next Thursday 5/8.
  - Our HW #5 discussion will be Tuesday 5/6 @ 6pm @ 110 Wheeler.

- I will also be preparing some final extra-credit problems. They will be distributed next week, and due at the final exam (5/20 @ 8am).

- The final exam is Tuesday, May 20 @ 8am @ 20 Barrows.
  - I will hold a review session the day before the final (May 19). Would a time in the afternoon (say 4-6pm) work for people? Pencil it in.

Today’s Agenda
- The Raven Paradox (cont’d)
- Next: The Grue Paradox

The traditional, Bayesian “comparative” assumptions are as follows
(protocol: for each object in the universe, write a true description in terms of R/B, and then throw slips into a giant urn, which is mixed and then sampled):

1. \( \Pr(\sim Ba \mid K_\alpha) > \Pr(Ra \mid K_\alpha) \)
2. \( \Pr(Ra \mid H & K_\alpha) = \Pr(Ra \mid K_\alpha) \)
3. \( \Pr(\sim Ba \mid H & K_\alpha) = \Pr(\sim Ba \mid K_\alpha) \)

\[ \therefore Ra \not\perp H \mid K_\alpha (0) \]

Theorem (HW #5). Any Pr satisfying (1), (2) and (3) will also be such that:

4. \( \Pr(H \mid Ra & Ba & K_\alpha) > \Pr(H \mid \sim Ba & \sim Ra & K_\alpha). \)

- Assumption (1) is uncontroversial. But, assumptions (2) and (3) are not.

Today’s Agenda
- The Raven Paradox (cont’d)
- Next: The Grue Paradox

- Views about (PC): Does \( \sim Ba & \sim Ra \mid E \) confirm \( (\forall x)(\sim Bx \supset \sim Rx) \mid [H]? \)
  - Hempel: Yes, relative to T. But, don’t conflate this with the claim (PC*) of confirmation relative to \( \sim Ra \), which is intuitively false. That’s a nice intuition, but, unfortunately, it contradicts Hempel’s theory \([M_\alpha]\).
  - Scheffler: Yes, but this does not imply that \( E \) confirms \( (\forall x)(Rx \supset Bx) \), since \( E \) is also a positive instance of the contrary of \( (\forall x)(Rx \supset Bx) \).
  - Quine: No [relative to T] because \( (NC_T) \) does not apply to \( \sim Ba, \sim Ra \), since they are not “natural kinds,” despite the fact that \( Ra \) and \( Ba \) are “NKs”. For Quine, “NKs” must have “sufficiently similar instances”.
  - Maher (2004): No, not even relative to T, since \( (NC_T) \) is demonstrably false within a Carnapian theory of “confirmation relative to T”. Note: The falsity of \( (NC_T) \) does not depend on “naturalness” of \( F \) and \( G \).
  - Bayesians: Depends on whether \( \Pr(H \mid E & K_\alpha) > \Pr(H \mid K_\alpha) \), where \( K_\alpha \) is our actual background knowledge. Bayesians think that \( (NC_T) \) is irrelevant, epistemically, and so they don’t care whether it’s true. And, even if the \( K_\alpha \) version is true, we can still give a comparative account.
Goodman's “Grue” Paradox: Basic Linguistic Structures and Facts I

- Let \( Ox \equiv x \) is observed prior to \( t \), \( Gx \equiv x \) is green, and \( Bx \equiv x \) is blue.
- "Grue": \( Gx \equiv x \) is either observed prior to \( t \) and green or \( x \) is not observed prior to \( t \) and blue. That is, \( Gx \equiv (Ox \& Gx) \lor (\neg Ox \& Bx) \).
- We can also define "Bleen" as: \( Bx \equiv (Ox \& Bx) \lor (\neg Ox \& Gx) \).

Two Facts.

- \( Gx \) is logically equivalent to \( (Ox \& Gx) \lor (\neg Ox \& Bx) \).
- \( Bx \) is logically equivalent to \( (Ox \& Bx) \lor (\neg Ox \& Gx) \).

So, from the point of view of the Green/Blue language, "Grue" and "Bleen" are "gerrymandered" or "positional" or "non-qualitative".

But, from the point of view of the Grue/Bleen language, "Green" and "Blue" are "gerrymandered" or "positional" or "non-qualitative".

So, no appeal to syntax will forge an asymmetry here, unless one assumes a privileged language. Note: the languages are expressively equivalent.

Goodman's “Grue” Paradox: Basic Linguistic Structures and Facts II

- I'm going to simplify things by re-defining “grue” using green and non-green. Quine wouldn't have liked this, but Goodman/Hempel wouldn't have minded. It will make the subsequent discussion easier.
- Thus, “Grue” becomes: \( Gx \equiv Ox \equiv Gx \). Now, consider the following two universal generalizations, and three singular evidential claims:
  - \( H_1 \): All emeralds are green. \( (\forall x)(Ex \supset Gx) \).
  - \( H_2 \): All emeralds are grue. \( (\forall x)(Ex \supset Gx) \). I.e., \( (\forall x)(Ex \supset (Ox \equiv Gx)) \).
  - \( E_1 \): \( a \) is a green emerald. \( Ea \land Ga \).
  - \( E_2 \): \( a \) is a grue emerald. \( Ea \land (Oa \equiv Ga) \).
  - \( \mathcal{E} \): \( a \) is a grue and green emerald. \( Ea \land (Oa \equiv Ga) \).
- The first part of Goodman's argument involves identifying an evidential claim that Hempel-confirms \( H_1 \) and \( H_2 \). \( E_1/E_2 \) do not fit the bill. Why?
- As Goodman points out (more detail later), \( \mathcal{E} \) Hempel-confirms both \( H_1 \) and \( H_2 \). Goodman thinks this is "bad news" for Hempel's theory. Why?
Here is a “reductio” of classical deductive logic (this is naïve and oversimplified, but I'll re-examine it on the next slide):

1. For all sets of statements $X$ and all statements $p$, if $X$ is inconsistent, then $p$ is a logical consequence of $X$.
2. If an agent $S$'s belief set $B$ entails $p$ (and $S$ knows $B = p$), then it would be reasonable for $S$ to infer/believe $p$.
3. Even if $S$ knows their belief set $B$ is inconsistent (and, hence, that $B = p$, for any $p$), there are still some $p$'s such that it would not be reasonable for $S$ to infer/believe $p$.
4. Since (1)-(3) lead to absurdity, our initial assumption (1) must have been false — reductio of the “explosion” rule (1).

- Harman [8] would concede that (1)-(3) are inconsistent, and (as a result) that something is wrong with premises (1)-(3).
- But, he would reject the relevantists’ diagnosis that (1) must be rejected. I take it he'd say it's (2) that is to blame here.

Note: the choice of deductive contexts in which $S$’s belief set $B$ is (known by $S$ to be) inconsistent is intentional here.

- In such contexts, there is a deep disconnect between (known) entailment relations and (kosher) inferential relations.
- One might try a more sophisticated deductive bridge principle (2') here. But, I conjecture a dilemma. Either:
  - (2') will be too weak to yield a (classically) valid “reductio”.
  - or
- (2') will be false. [Our original BP (2) falls under this horn.]

- Let $B$ be $S$'s belief set, and let $q$ be the conjunction of the elements $B_i$ of $B$. Here are two more candidate BP’s:
  - (2'1) If $S$ knows that $B = p$, then $S$ should not be such that both: $S$ believes $q$, and $S$ does not believe $p$.
  - (2'2) If $S$ knows that $B = p$, then $S$ should not be such that both: $S$ believes each of the $B_i \in B$, and $S$ does not believe $p$.
- (2'2) is false (preface paradox) and too weak (it’s wide scope).
- (2'1) may be true, but it is also too weak. [It's wide scope, and the agent can reasonably disbelieve both $q$ and $p$.]

So, I think Harman is right about such “relevantist” arguments.

Next, I will argue that Goodman’s “grue” argument against CIL fails for analogous reasons (indeed, I'll argue it’s even worse!).

I'll begin by discussing the IL’s of Hempel and Carnap.

- Hempelian IL (confirmation theory) uses entailment to explicate “inductive logical support” (confirmation) — a logical relation between statements. [i.e., $E$ confirms $H$ iff $E = \text{dev}_E(H)$]
- Hempel’s theory has the following three key consequences:

  - (EQC) If $E$ confirms $H$ and $E \equiv E'$, then $E'$ confirms $H$.
  - (NC) For all constants $x$ and all (consistent) predicates $\phi$ and $\psi$: $\phi x \& \psi x'$ confirms $\forall y (\phi y \supset \psi y')$.
  - (M) For all $x$, for all (consistent) $\phi$ and $\psi$, and all statements $H$: If $\phi x$ confirms $H$, then $\phi x \& \psi x'$ confirms $H$.

- These three properties are the crucial ones needed to reconstruct Goodman’s “grue” argument against Hempel.
- Before giving a precise reconstruction of Goodman’s “grue” argument, we’ll look at the essentials of Carnapian IL/CT.

Carnapian confirmation (i.e., later Carnapian theory [13] — see “Extras”) is based on probabilistic relevance, not entailment:

- $E$ confirms $H$, relative to $K \text{ iff } Pr(H \mid E \& K) > Pr(H \mid K)$, for some “suitable” conditional probability function $Pr(\cdot \mid \cdot)$.
  
  - Note how this is an explicitly 3-place relation.
  - Hempel's was only 2-place. This is because $Pr(\text{unlike } \equiv)$ is non-monotonic.
  - Carnap thought that “suitable $Pr$” meant “logical $Pr$” in a rather strong sense (see “Extras”). However, Goodman’s argument will work against any probability function $Pr$.

Carnap’s theory implies only 1 of our 3 Hempelian claims: (EQC). It does not imply (NC) or (M) (see “Extras” & [3]/[13]).

- This will allow Carnapian IL to avoid facing the full brunt of Goodman’s “grue” (but, it will still face a serious challenge).

- For Carnap, confirmation is a logical relation (akin to entailment). Like entailment, confirmation can be applied, but this requires epistemic bridge principles [akin to (2)].
- Carnap [1] discusses various bridge principles. The most well-known of these is the requirement of total evidence.

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**The Requirement of Total Evidence.** In the application of IL to a given knowledge situation, the total evidence available must be taken as a basis for determining the degree of confirmation.

This *sounds* like a plausible principle. But, once it is made more precise, it will actually turn out to be subtly defective.

More precisely, we have the following *bridge principle* connecting confirmation and evidential support:

(RTE) \(E\) evidently supports \(H\) for \(S\) in \(c\) iff \(E\) confirms \(H\), relative to \(K\), where \(K\) is \(S\)'s total evidence in \(c\).

The (RTE) has often been (implicitly) presupposed by Bayesian epistemologists (both subjective and objective).

However, as we will soon see, the (RTE) is not a tenable bridge principle, and for reasons independent of “grue”.

Moreover, Goodman’s “grue” argument will rely *more heavily* on (RTE) than the relevantists’ argument relies on (2). In this sense, Goodman’s argument will be even worse.

Before reconstructing the argument, a brief “grue” primer.

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### A Proof of (†) From Hempel’s (NC), (M), and (EQC)

\[
(\forall x)(Ex \supset Gx) \quad (\forall x)[Ex \supset (Ox \equiv Gx)]
\]

\[
\uparrow \quad \uparrow
\]

\[
(Ea \& Ga) \quad Ea \& (Oa \equiv Ga)
\]

\[
\uparrow \quad \uparrow
\]

\[
(Ea \& Ga) \& Oa \quad (Ea \& (Oa \equiv Ga)) \& Oa
\]

\[
\downarrow \quad \downarrow
\]

\[
(Ea \& Oa \& Ga = \mathcal{E})
\]

---

Let \(Gx \equiv x\) is green, \(Ox \equiv x\) is examined prior to \(t\), and \(Ex \equiv x\) is an emerald. Goodman introduces a predicate “grue” \(Gx \equiv x\) is grue \(\equiv Ox \equiv Gx\).

Consider the following two universal generalizations

\((H_1)\) All emeralds are green, \([(\forall x)(Ex \supset Gx)]\)

\((H_2)\) All emeralds are grue, \([(\forall x)[Ex \supset (Ox \equiv Gx)]]\)

And, consider the following instantional evidential statement \((\mathcal{E})\) \(Ea \& Oa \& Ga\)

Hempel’s confirmation theory \([(\text{EQC}) \& (\text{NC}) \& (\text{M})]\) entails:

\((\dagger)\) \(\mathcal{E}\) confirms \(H_1\), and \(\mathcal{E}\) confirms \(H_2\). [†proven]

As a result, his theory entails the following weaker claim

\((\ddagger)\) \(\mathcal{E}\) confirms \(H_1\) if and only if \(\mathcal{E}\) confirms \(H_2\).

What about (later) Carnapian theory? Does it entail even (\(\ddagger\))?

Interestingly, NO! There are (later) Carnapian Pr-models in which \(\mathcal{E}\) confirms \(H_1\) but \(\mathcal{E}\) disconfirms \(H_2\) (see “Extras”).

In this sense, Hempel was an easier target for Goodman than Carnap (Goodman claims to be attacking both).

Now, we’re ready to reconstruct Goodman’s argument.

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There is just one more ingredient in Goodman’s argument:

- The agent \(S\) who is assessing the evidential support that \(\mathcal{E}\) provides for \(H_1\) vs \(H_2\) in a Goodmanian “grue” context \(C_g\) has \(Oa\) as part of their total evidence in \(C_g\), (e.g., [14].)

Now, we can run the following Goodmanian *reductio*:

(i) \(\mathcal{E}\) confirms \(H\), relative to \(K\) iff \(\Pr(H \mid E \& K) > \Pr(H \mid K)\).

(ii) \(\mathcal{E}\) evidently supports \(H\) for \(S\) in \(C\) iff \(\mathcal{E}\) confirms \(H\), relative to \(K\), where \(K\) is \(S\)'s total evidence in \(C\).

(iii) The agent \(S\) who is assessing the evidential support \(\mathcal{E}\) provides for \(H_1\) vs \(H_2\) in a Goodmanian “grue” context \(C_g\) has \(Oa\) as part of their total evidence in \(C_g\) [i.e., \(K \equiv Oa\)].

(iv) If \(K \equiv Oa\), then—c.p.—\(\mathcal{E}\) confirms \(H_1\) relative to \(K\) iff \(\mathcal{E}\) confirms \(H_2\) relative to \(K\), for any \(\Pr\) [i.e., (\(\ddagger\)) holds, \(\forall\) \(\Pr\)'s].

(v) Therefore, \(\mathcal{E}\) evidently supports \(H_1\) for \(S\) in \(C_g\) if and only if \(\mathcal{E}\) evidentially supports \(H_2\) for \(S\) in \(C_g\).

(vi) \(\mathcal{E}\) evidentially supports \(H_1\) for \(S\) in \(C_g\), but \(\mathcal{E}\) does not evidentially support \(H_2\) for \(S\) in \(C_g\).

\(\therefore\) (i)-(vi) lead to an absurdity. Hence, our initial assumption (i) must have been false. Carnapian inductive logic refuted?
Branden Fitelson  
Epistemological Critiques of “Classical” Logic: Two Case Studies  
fitelson.org

Premise (vi) is based on Goodman’s epistemic intuition that, in “grue” contexts, \(E\) evidentially supports \(H_1\) but not \(H_2\).

Premise (v) follows logically from premises (i)–(iv).

Premise (iv) is a theorem of probability calculus (any Pr).

The c.p. clause needed is Pr(\(Ea \mid H_1 \& K\)) = Pr(\(Ea \mid H_2 \& K\)), which is assumed in all probabilistic renditions of “grue”.

Premise (iii) is an assumption about the agent’s background knowledge \(K\) that’s implicit in Goodman’s set-up. See [14].

Premise (ii) is (RTE). It’s the bridge principle, akin to (2) in the relevantists’ reductio. This is the premise I will focus on.

Here are my two main points about Goodman’s argument:

(ii) must be rejected by Bayesians for independent reasons.

Carnapian confirmation theory doesn’t even entail (i).

[Hempel’s theory does, just as deductive logic entails (1).]

This suggests Goodman’s argument is even less a reductio of (i) than the relevantists’ argument is a reductio of (1).

Next, I will explain why Carnapians/Bayesians should reject (ii) on independent grounds: The Problem of Old Evidence.

As Tim Williamson points out [16, ch. 9], Carnap’s (RTE) must be rejected, because of the problem of old evidence [2].

If \(S\)’s total evidence in \(C\) \((K)\) entails \(E\), then, according to (RTE), \(E\) cannot evidentially support any \(H\) for \(S\) in \(C\).

As a result, one cannot (in all contexts) use Pr(\(\cdot \mid K\)) — for any Pr — when assessing the evidential import of \(E\).

There are (basically) two kinds of strategies for revising (RTE). Carnap [1, p. 472] & Williamson [16, ch. 9] propose: (RTE\(_\neg\)) (RTE\(_\neg\)) \(E\) evidentially supports \(H\) for \(S\) in \(C\) iff \(S\) possesses \(E\) as evidence in \(C\) and Pr\((H \mid E \& K_{\neg}) > Pr\((H \mid K_{\neg}). ([K_{\neg} is a priori, Pr_{\neg} is “inductive” [13]/“evidential” [16]/“logical” [1].]

Note: Hempel explicitly required that confirmation be taken “relative to \(K_{\neg}\)” in all treatments of the paradoxes [9, 10]. (RTE\(_\neg\)) is a charitable Carnapian reconstruction of Hempel.

A more “standard” way to revise (RTE) is ([(RTE\(_\neg\))] to use Pr\(_S\)\((\cdot \mid K_{\neg})\) where \(K = K_{\neg} \neq E\), and Pr\(_S\) is the credence function of a “counterpart” \(S’\) of \(S\) with total evidence \(K’\).

Carnap never re-wrote the part of LFP [1] that discusses the (RTE), in light of a probabilistic relevance (“increase in firmness” [1]) notion of confirmation. This is too bad.

If Carnap had discussed this (“old evidence”) issue, I suspect he would have used something like Williamson’s (RTE\(_\neg\)) as his bridge principle connecting confirmation and evidence.

Various other philosophers have proposed similar accounts of “support” as some probabilistic relation, taken relative to an “informationless” or “a priori” background/probability.

Richard Fumerton (who, unlike Williamson, is an epistemological internalist) proposes such a view in his [4].

Patrick Maher [13] applies such relations extensively in his recent (neo-Carnapian) work on confirmation theory.


So, many Bayesians already reject (RTE). [Of course, “grue” gives Bayesians another important reason to reject (RTE).]
(K) Either: (H1) there are 1000 green emeralds 900 of which have been examined before t, no non-green emeralds, and 1 million other things in the universe, or (H2) there are 100 green emeralds that have been examined before t, no green emeralds that have not been examined before t, 900 non-green emeralds that have not been examined before t, and 1 million other things.

Imagine an urn containing true descriptions of each object in the universe (Pr ≡ urn model). Let $\mathcal{E}$ ≡ “Ea & Oa & Ga” be drawn. $\mathcal{E}$ confirms $H_1$ but $\mathcal{E}$ disconfirms $H_2$, relative to K:

$$\Pr(\mathcal{E} \mid H_1 & K) = \frac{900}{1001000} > \frac{100}{1001000} = \Pr(\mathcal{E} \mid H_2 & K)$$

This $K/Pr$ constitute a counterexample to (‡), assuming a “Carnapian” theory of confirmation. This probability model can be emulated in the later Carnapian $\lambda/y$–systems [13].
Is “Grue” an Observation Selection Effect? Part II

- Note: the “grue” hypothesis ($H_2$) entails the following claim, which is not entailed by the green hypothesis ($H_1$):
  $$(H') \text{ All green emeralds have been (or will have been) examined prior to } t. \{(\forall x)((E \land Gx) \Rightarrow Ox)\}.$$  
- Now, consider the following two observation processes:
  - **Process 1.** For each green emerald in the universe, a slip of paper is created, on which is written a true description of that object as to whether it has property $O$. All the slips are placed in an urn, and one slip is sampled at random from the urn. By this process, we learn $(E)$ that $Ea \land Ga \land Oa$. 
  - **Process 2.** Suppose all the green emeralds in the universe are placed in an urn. We sample an emerald ($a$) at random from this urn, and we examine it. [We know antecedently that the examination of $a$ will take place prior to $t$, i.e., that $Oa$ is true.] By this process, we learn $(E)$ that $Ea \land Ga \land Oa$.
  - Goodman seems to presuppose Process 2 in his set-up.

What Could “Carnapian” Inductive Logic Be? Part II

- I propose a different reading of the later Carnap, which makes him much more coherent with the early Carnap.
- I propose weakening the supervenience requirement in such a way that it (a) ensures this coherence, and (b) maintains the “logicality” of confirmation relations in Carnap’s sense.
- Let $\mathcal{L}$ be a formal language strong enough to express the fragment of probability theory Carnap needs for his later, more sophisticated confirmation-theoretic framework.
  - **Weak Supervenience (WS).** All confirmation relations involving sentences of a first-order language $\mathcal{L}$ supervene on the deductive relations involving sentences of $\mathcal{L}$.
- As it turns out, $\mathcal{L}$ needn’t be very strong (in fact, one can get away with PRA!). So, even by early (logicist) Carnapian lights, satisfying (WS) is all that is really required for “logicality”.
- The specific (WS) approach I propose takes confirmation to be a four-place relation: between $E$, $H$, $K$, and a function $Pr$. 

What Could “Carnapian” Inductive Logic Be? Part III

- Consequences of moving to a 4-place confirmation relation:
  - We need not try to “construct” “logical” probability functions from the syntax of $\mathcal{L}$. This is a dead-end anyhow.
  - Indeed, on this view, inductive logic has nothing to say about the interpretation/origin of $Pr$. That is not a logical question, but a question about the application of logic.
    - Analogy: Deductive logicians don’t owe us a “logical interpretation” of the truth value assignment function $\nu$.
    - Moreover, this leads to a vast increase in the generality of inductive logic. Carnap was stuck with an impoverished set of “logical” probability functions (in his $\lambda$-$\gamma$-continuum).
  - On my approach, any probability function can be part of a confirmation relation. Which functions are “suitable” or “appropriate” or “interesting” will depend on applications.
  - So, some confirmation relations will not be “interesting”, etc.
  - But, this (already) true of entailments, as Harman showed.
  - Questions: Now, what is the job of the inductive logician, and how (if at all) do they interact with epistemologists?
The inductive logician must explain how it is that inductive logic can satisfy the following Carnapian desiderata.

- The confirmation function $c(H, E | K)$ quantifies a logical (in a Carnapian sense) relation among statements $E$, $H$, and $K$.
  
- One aspect of “logicality” is ensured by moving from (SS) to (WS) [from an $L$-determinate to an $L$-determinate concept].

- Another aspect of “logicality” insisted upon by Carnap is that $c(H, E | K)$ should generalize the entailment relation.

- This means (at least) that we need $c(H, E | K)$ to take a maximum (minimum) value when $E \& K \models H$ ($E \& K \models \neg H$).

- Very few relevance measures $c$ satisfy this “generalizing entailment” requirement. That's another job for the inductive logician.

- There must be some interesting “bridge principles” linking $c$ and some relations of evidential support, in some contexts.

- (D2) implies that if there are any such bridge principles linking entailment and conclusive evidence, these should be inherited by $c$. This brings us back to Harman’s problem!

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The “new riddle” is about inductive logic (not epistemology).

**Quote #1** (page 67): “Just as deductive logic is concerned primarily with a relation between statements — namely the consequence relation — that is independent of their truth or falsity, so inductive logic . . . is concerned primarily with a comparable relation of confirmation between statements. Thus the problem is to define the relation that obtains between any statement $S_1$ and another $S_2$ if and only if $S_1$ may properly be said to confirm $S_2$ in any degree.”

**Quote #2** (73): “Confirmation of a hypothesis by an instance depends . . . upon features of the hypothesis other than its syntactical form”.

But, Goodman’s methodology appeals to epistemic intuitions.

**Quote #3** (page 73): “. . . the fact that a given man now in this room is a third son does not increase the credibility of statements asserting that other men now in this room are third sons, and so does not confirm the hypothesis that all men now in this room are third sons.”