

## Philosophy 148 — Announcements & Such

- I hope you all enjoyed Mike & Kenny's lectures last week!
- HW #3 grades are posted. People did very well ( $\mu = 93, \sigma = 8$ ).
- I've posted solutions (and common mistakes) for HW #2.
- HW #4 is due Thursday. I'll discuss its content today, and tonight in our HW #4 discussion session, which is at **6pm tonight @ 136 Barrows**.
- Today's Agenda
  - Finishing-up the “Carnapian Programme” stuff.
  - Inductive Logic and Inductive Epistemology (again)
  - Then: **Confirmation Theory** (also, for the rest of the semester)
    - \* Back to early theories of confirmation (Keynes, Nicod, Hempel)
    - \* Then: Contemporary (subjective) probabilistic approaches
    - \* The Paradoxes of Confirmation (Ravens and Grue)
    - \* Psychological Applications of Confirmation Theory

## Carnap's Programme for Inductive Logic/Confirmation Theory

- Carnap's desiderata for inductive logic/confirmation theory:
  - ( $\mathcal{D}_1$ ) Confirmation theory aims to characterize a function  $c(H, E)$ , which *generalizes entailment*, in the sense that  $c(H, E)$  should take on a *maximal* value when  $E \models H$ , and a *minimal* value when  $E \models \sim H$ .
  - ( $\mathcal{D}_2$ ) The relation  $c$  should be *objective* and *logical*. [For Carnap, this was contrasted with *psychological* relations — *anti-psychologism*.]
  - ( $\mathcal{D}_3$ ) Confirmation theory/inductive logic should be *applicable to/connected with* epistemology in some (non-trivial) way. [For Carnap, this meant that some non-trivial *bridge principle* connecting  $c$  and *evidential support* should hold. He suggested the (RTE), which has problems.]
  - ( $\mathcal{D}_4$ ) The relation  $c$  should be defined in terms of *probability*. [For Carnap, ( $\mathcal{D}_1$ ), ( $\mathcal{D}_2$ ), and ( $\mathcal{D}_4$ ) implied that there must be “logical” probabilities  $\text{Pr}_\top$ . Later, I will explain an alternative way to satisfy these three  $\mathcal{D}$ 's.]

## Inductive Logic and Inductive Epistemology (Applicability)

- Carnap originally proposed the following *bridge principle*:  
 (RTE<sub>C</sub>) *E* evidentially supports *H* for an agent *S* in an epistemic context *C*  
 $\iff \Pr_{\top}(H \mid E \ \& \ K) > r$ , where *K* is *S*'s total evidence in *C*.
- Popperian (*e.g.*, “rare disease”) examples lead to this alteration:  
 (RTE'<sub>C</sub>) *E* evidentially supports *H* for an agent *S* in an epistemic context *C*  
 $\implies \Pr_{\top}(H \mid E \ \& \ K) > \Pr_{\top}(H \mid K)$ , where *K* is *S*'s total evidence in *C*.
- But, even this refinement of (RTE) has counterexamples. For instance, “old evidence” cases in which  $K \models E$ . We'll discuss another soon (“grue”).
- This leads one to re-think the applicability desideratum ( $\mathcal{D}_3$ ). Maybe it is misguided altogether, or maybe it's just really hard to satisfy.
- Last time, I talked about “bridge principles” in deductive logic (knowledge and  $\models$ ). I pointed out that they are very difficult to articulate. Be that as it may, many still think there is *some* connection. I'll return to this later.

## Confirmation Theory I: Keynes and Nicod (Roots)

- Keynes (1921) was the first to clearly articulate a *probabilistic relevance* conception of inductive support. Nicod (1930) continued this thread.
- Nicod's three basic tenets of (instantial) confirmation were as follows:
  - Instantial confirmation is a relation between singular and general propositions/statements (or, if you will, between “facts” and “laws”).
  - Confirmation consists in *positive probabilistic relevance*, and disconfirmation consists in *negative probabilistic relevance* (where the salient probabilities are inductive / *a priori* in the Keynesian sense).
  - Universal generalizations are confirmed by their positive instances and disconfirmed by their negative instances. [*The Nicod Condition* (NC)]
- These tenets (especially NC) became the basic principles of early confirmation theory. Hempel (the father of modern confirmation theory) picked-up where Nicod left off, but in a rather strange (and different) way.

## Confirmation Theory II: Hempel (The Father of $c$ -Theory)

- Hempel wrote several seminal papers about confirmation theory in the 30's and 40's. This set the agenda for confirmation theory since.
- Hempel begins by discussing Nicod's views about instancial confirmation. Strangely, however, Hempel interprets Nicod's (NC) in the following way:  
 (NC<sub>0</sub>) For all objects  $x$  (with names  $x$ ), and all predicate expressions  $\phi$  and  $\psi$ :  
 $x$  confirms  $\lceil (\forall y)(\phi y \supset \psi y) \rceil$  iff  $\lceil \phi x \ \& \ \psi x \rceil$  is true, and  
 $x$  disconfirms  $\lceil (\forall y)(\phi y \supset \psi y) \rceil$  iff  $\lceil \phi x \ \& \ \sim \psi x \rceil$  is true.
- This is a somewhat puzzling way of reading Nicod, in several respects:
  - It interprets Nicod as describing a relation between *objects* and universal claims, not between *singular claims* and universal claims.
  - It abstracts away from (and does not mention) *probabilistic relevance*.
  - It understands the notion of “positive instance” in a *conjunctive* way.
  - It leads to an absurd confirmation relation in several respects.

## Confirmation Theory II: Hempel (The Father of $c$ -Theory)

- The most patent absurdity of Hempel's (NC<sub>0</sub>)-reading of Nicod is that it leads to a  $c$ -relation that violates the *hypothetical equivalence condition*: (EQC<sub>H</sub>) If  $x$  confirms  $H$ , then  $x$  confirms anything logically equivalent to  $H$ .
- Hempel himself pointed this out, using the following example.
  - $a$  confirms " $(\forall y)(Fy \supset Gy)$ ," provided  $a$  is such that  $Fa \ \& \ Ga$ .
  - *Nothing* can confirm " $(\forall y)[(Fy \ \& \ \sim Gy) \supset (Fy \ \& \ \sim Fy)]$ ," since *no object*  $a$  can be such that  $Fa \ \& \ \sim Fa$ .
  - But,  $(\forall y)(Fy \supset Gy) \equiv (\forall y)[(Fy \ \& \ \sim Gy) \supset (Fy \ \& \ \sim Fy)]$ .
- This means that (NC<sub>0</sub>) leads to a confirmation relation that depends on *how propositions are expressed*, which seems unintuitive.
- For Hempel, confirmation is a *logical* relation, and logical relations (for Hempel) do not depend on choice of description in this sensitive way.
- Hempel gives an alternative theory of confirmation that avoids this.

## Hempel's Confirmation Theory I

- After giving-up on  $(NC_0)$ , Hempel laid down the following *desiderata*, in addition to the Hypothetical Equivalence Condition ( $EQC_H$ ).

**Entailment Condition (EC).** If  $E \models H$ , then  $E$  confirms  $H$ .

**Special Consequence Condition (SCC).** If  $E$  confirms  $H$ , and  $H \models H'$ , then  $E$  confirms  $H'$ .

**Consistency Condition (CC).** If  $E$  confirms  $H$ , and  $E$  confirms  $H'$ , then  $H$  and  $H'$  are logically consistent.

**Non-Triviality Condition (NTC).** For all  $H$ , there exists an  $E$  which does *not* confirm  $H$ .

- Because Hempel accepts these desiderata, he *must* reject the following:

**Converse Consequence Condition (CCC).** If  $E$  confirms  $H$ , and  $H' \models H$ , then  $E$  confirms  $H'$ .

- Otherwise, the desiderata would be *logically inconsistent*. HW #4!
- I will discuss these desiderata critically, below. But, first, let's look at the theory Hempel comes up with, which satisfies these desiderata.

## Hempelian Confirmation Theory II

- Hempel advances an “instance” account satisfying his desiderata. The key definition behind his deductive theory of instancial confirmation is:
- The *development of a hypothesis  $H$  for a set of individuals  $I$*  [ $dev_I(H)$ ] is (intuitively) “what  $H$  says (*extensionally*) about the members of  $I$ ”.
- $dev_I(H)$  is obtained by (i) *conjoining* all the  $I$ -instances of  $H$ , if  $H$  is a *universal* ( $\forall$ ) claim, and (ii) *disjoining* all the  $I$ -instances of  $H$ , if  $H$  is an *existential* ( $\exists$ ) claim. [ $I$ -instances of  $H$  are basic sentences that *satisfy*  $H$ .]
- Satisfaction is *semantical* (“*makes true*”) *not* syntactical (*contra*  $NC_0$ ). If  $H \models H'$ , they have the same  $I$ -instances (say the same things about  $I$ ).
- Let  $I = \{a, b\}$ , then we have:
  - If  $H = (\forall x)Bx$ , then  $dev_I(H) = Ba \ \& \ Bb$ .
  - If  $H = (\exists x)Rx$ , then  $dev_I(H) = Ra \ \vee \ Rb$ .
  - If  $H = (\forall x)(\exists y)Lxy$ , then (working from the outside-in):

$$dev_I(H) = (\exists y)Lay \ \& \ (\exists y)Lby = (Laa \ \vee \ Lab) \ \& \ (Lba \ \vee \ Lbb)$$

## Hempel's Confirmation Theory III

- **Def.**  $E$  directly-Hempel-confirms  $H$ , just in case  $E \models_{dev_I}(H)$  for the class  $I$  of individuals mentioned in  $E$ .  $E$  Hempel-confirms  $H$  iff  $E$  directly Hempel confirms every member of a set of sentences  $S$  such that  $S \models H$ .
- Why the two definitions?  $Ra \ \& \ Ba$  does *not* directly Hempel-confirm  $Rb \supset Bb$ , but  $Ra \ \& \ Ba$  does Hempel-confirm  $Rb \supset Bb$  ( $\alpha$ -variants).
- Problematic Examples for Hempel's Theory:
  - Let  $I = \{a, b\}$ ,  $H = (\forall x)(\forall y)Rxy$ ,  $E \stackrel{\text{def}}{=} Raa \ \& \ Rab \ \& \ Rbb \ \& \ Rba$ ,  $E' \stackrel{\text{def}}{=} Raa \ \& \ Rab \ \& \ Rbb$ , and  $E'' \stackrel{\text{def}}{=} Raa$ . Then,  $E''$  confirms  $H$ ,  $E'$  does not confirm  $H$ , and  $E$  does confirm  $H$ . Make sure you see why.
  - No consistent  $E$  can confirm the following, which is true on  $\mathbb{N}$ ,
 
$$(H) \ (\forall x)(\exists y)x < y \ \& \ (\forall x)x \neq x \ \& \ (\forall x)(\forall y)(\forall z)[(x < y \ \& \ y < z) \supset x < z]$$
 since  $dev_I(H)$  is inconsistent, for any finite  $I$ ! Exercise: Prove this!
- The Paradoxes of Confirmation pose deeper problems for Hempel.

## Hempelian Confirmation Theory IV

- **The Paradox of the Ravens:** Consider the hypothesis that all ravens are black,  $H: (\forall x)(Rx \supset Bx)$ . Which of these 6 claims Hempel-confirms  $H$ ?

$E_1: Ra \ \& \ Ba$	$E_2: \sim Ra$	$E_3: Ba$
$E_4: \sim Ra \ \& \ \sim Ba$	$E_5: \sim Ra \ \& \ Ba$	$E_6: Ra \ \& \ \sim Ba$

Answer: *All but  $E_6$  Hempel-confirm  $H$ !* Make sure you see why.

- **Goodman's New Riddle of Induction:** Consider the hypothesis that all ravens are "blite", where the predicate "blite" ( $B$ ) is defined as follows:  
 $x$  is blite iff *either* (i)  $x$  is examined before (the end of) today, and  $x$  is black *or* (ii)  $x$  is examined after today, and  $x$  is white.  
 $Ra \ \& \ Ba$  Hempel-confirms  $H$ . The observation of a black raven today confirms the hypothesis that ravens observed tomorrow will be white?!?
- We'll discuss these infamous historical paradoxes in great depth soon ...
- Also:  $Ra \ \& \ Ba$  Hempel-confirms  $(\forall x)[\phi x \supset Bx]$ , for *any*  $\phi$ .

## Hempel's Desiderata — Critical Discussion

- Probabilistic accounts of confirmation will accept some of Hempel's desiderata, but they will reject others. And, these rejections are *intuitive*.
  - The EQC, the EC, and the NTC all seem quite intuitive, and they are satisfied by any probabilistic account of confirmation. Prove this!
  - CC is *not* intuitive. Typically, competing theories are *not* consistent. Still, it is often the case that evidence confirms several competing theories, though it may confirm some *more strongly* than others.
  - Example:  $E$  = card is black,  $H$  = card is the A♠,  $H'$  = card is the J♣. Intuitively,  $E$  confirms both  $H$  and  $H'$ , even though they are inconsistent.
  - SCC is not intuitive either. Many intuitive counterexamples are out there. *E.g.*,  $E$  = card is black,  $H$  = card is card is the A♠, and  $H'$  = card is an ace.
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- As for CCC, it is *highly unintuitive* (here, we agree with Hempel). *E.g.*,  $E$  = card is the A♠,  $H$  = card is card is an ace, and  $H'$  = card is the A♦.

## A Catalogue of Properties of Confirmation Relations I

- (M<sub>E</sub>) If  $E$  confirms  $H$  relative to  $K$ , then  $E \& E'$  confirms  $H$  relative to  $K$  (provided that  $E'$  does not contain any constant symbols not contained in  $\{H, E, K\}$ ).
- (M<sub>K</sub>) If  $E$  confirms  $H$  relative to  $K$ , then  $E$  confirms  $H$  relative to  $K \& K'$  (provided that  $K'$  does not contain any constant symbols not contained in  $\{H, E, K\}$ ).
- (NC) ' $\phi x \& \psi x$ ' confirms ' $(\forall y)(\phi y \rightarrow \psi y)$ ' relative to (some/all/specific)  $K$ .
- (SCC) If  $E$  confirms  $H$  relative to  $K$  and  $H \models_K H'$ , then  $E$  confirms  $H'$  relative to  $K$ .
- (CCC) If  $E$  confirms  $H$  relative to  $K$  and  $H' \models_K H$ , then  $E$  confirms  $H'$  relative to  $K$ .
- (CC) If  $E$  confirms  $H$  relative to  $K$  and  $E$  confirms  $H'$  relative to  $K$ , then  $K \neq \sim(H \& H')$ .
- (CC') If  $E$  confirms  $H$  relative to  $K$  and  $E$  confirms  $H'$  relative to  $K$ , then  $K \neq \sim(H \equiv H')$ .
- (EC) If  $E \models_K H$ , then  $E$  confirms  $H$  relative to  $K$ .
- (CEC) If  $H \models_K E$ , then  $E$  confirms  $H$  relative to  $K$ .
- (EQC<sub>E</sub>) If  $E$  confirms  $H$  relative to  $K$  and  $K \models E \equiv E'$ , then  $E'$  confirms  $H$  rel. to  $K$ .
- (EQC<sub>H</sub>) If  $E$  confirms  $H$  relative to  $K$  and  $K \models H \equiv H'$ , then  $E$  confirms  $H'$  rel. to  $K$ .

(EQC<sub>K</sub>) If  $E$  confirms  $H$  relative to  $K$  and  $K \models K'$ , then  $E$  confirms  $H$  relative to  $K'$ .

(NT) For some  $E, H$ , and  $K$ ,  $E$  confirms  $H$  relative to  $K$ . And, for every  $E/K$ , there exists an  $H$  such that  $E$  does *not* confirm  $H$  relative to  $K$ .

(ST) If  $E$  confirms  $H$  relative to  $K$  and  $E$  confirms  $H$  relative to  $\sim K$ , then  $E$  confirms  $H$  relative to  $T$ .

- The monotonicity properties (M<sub>E</sub>) and (M<sub>K</sub>) are satisfied by Hempel's theory of confirmation. It is worth examining why this is the case.
- As it turns out, the monotonicity properties are not desirable for confirmation relations — even by Hempel's own lights, as we'll soon see.
- This is an important (and embarrassing) fact about Hempel's theory — one which is not shared by Pr-accounts (probability is *non-monotonic*!).
- (CC') is something that *is* satisfied by probabilistic accounts. Why?
- Interestingly, (ST) is *violated* by probabilistic relevance (PR) accounts. But, it is satisfied by the conditional-probability-threshold (CPT) account. Why?
- Does Hempel's theory satisfy (ST)? Why/why not? How about CPT?

## Hypothetico-Deductive (HD) Confirmation

- The general form of a deductive (*i.e.*, H-D) prediction is:

*H.* Hypothesis under test.

*K.* Background assumptions (initial conditions, *etc.*).

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*E.* Observational (deductive) prediction.

- We can also look at the “reverse inference”, *from* the observation *E* to the hypothesis *H* (*given K*). NOTE: this direction is *inductive* (double-line)!

*E.* Observational (deductive) prediction.

*K.* Background assumptions (initial conditions, *etc.*).

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*H.* Hypothesis under test.

- The basic idea: *E* HD-confirms *H*, relative to *K* iff  $H \models_K E$ . Note how this has *H* on the left of a  $\models$ , whereas Hempel’s has *E* on the left. This is a crucial difference. Think about (SCC) and (CCC) for the two theories.
- This is merely a *qualitative* claim, that *E* confirms *H*, relative to *K* (to some positive degree or other — like Hempel’s qualitative theory).

## A Catalogue of Properties of Confirmation Relations II

Concept	Does Concept Satisfy Condition?										
	EQC	EC	CC	NT	SCC	CCC	CEC	M	NC	CC'	ST
Hempel	YES	YES	YES <sup>a</sup>	YES	YES	NO	NO	YES	YES	YES <sup>a</sup>	YES
HD	YES	NO	NO	YES	NO	YES	YES	NO	NO	YES <sup>e</sup>	YES
CPT	YES	YES <sup>b</sup>	NO	YES	YES	NO	NO	NO	NO	YES <sup>d</sup>	YES
PR	YES	YES <sup>c</sup>	NO	YES	NO	NO	YES <sup>c</sup>	NO	NO	YES	NO

<sup>a</sup>Assuming that  $E \& K$  is not self-contradictory.

<sup>b</sup>Assuming that  $\Pr(E | K) \neq 0$ .

<sup>c</sup>Assuming that  $\Pr(H | K) \in (0, 1)$ , and  $\Pr(E | K) \in (0, 1)$ .

<sup>d</sup>Assuming that  $t \geq \frac{1}{2}$ .

<sup>e</sup>Assuming that  $K \neq E$ .

## The Raven Paradox (aka., The Paradox of Confirmation)

- **Nicod Condition (NC):** For any object  $x$  and any properties  $F$  and  $G$ , the proposition that  $x$  has both  $F$  and  $G$  confirms the proposition that every  $F$  has  $G$ . Strong second-order condition:

$$(\forall F)(\forall G)(\forall x)[Fx \ \& \ Gx \text{ confirms } (\forall x)(Fx \supset Gx)]$$

- **Equivalence Condition (EC):** For any propositions  $H_1$ ,  $E$ , and  $H_2$ , if  $E$  confirms  $H_1$  and  $H_1$  is (*classically!*) logically equivalent to  $H_2$ , then  $E$  confirms  $H_2$ . Weak 2<sup>nd</sup> order condition:

$$(\forall E)(\forall H_1)(\forall H_2)[E \text{ confirms } H_1 \text{ and } H_1 \models H_2 \Rightarrow E \text{ confirms } H_2]$$

- **Paradoxical Conclusion (PC):** The proposition that  $a$  is both nonblack and a nonraven confirms the proposition that every raven is black. This is a first-order condition (arbitrary  $a$ ):  $\sim Ba \ \& \ \sim Ra$  confirms  $(\forall x)(Rx \supset Bx)$ .

**Proof.** (1) By (NC),  $\sim Ba \ \& \ \sim Ra$  confirms  $(\forall x)(\sim Bx \supset \sim Rx)$ .

(2) By Classical Logic,  $(\forall x)(\sim Bx \supset \sim Rx) \models (\forall x)(Rx \supset Bx)$ .

$\therefore$  (PC) By (1), (2), (EC),  $\sim Ba \ \& \ \sim Ra$  confirms  $(\forall x)(Rx \supset Bx)$ .

- Hempel & Goodman *embraced* (NC), (EC) *and* (PC). They saw **no paradox**. Hempel *explains away* the paradoxical *appearance* (Goodman does same):
  - ... in the seemingly paradoxical cases of confirmation, we are often not judging the relation of the given evidence  $E$  *alone* to the hypothesis  $H$
  - ... instead, we tacitly introduce a comparison of  $H$  with ...  $E$  in conjunction with ... additional ... information we ... have at our disposal.
- Hempel's Idea:  $E [\sim Ra \ \& \ \sim Ba]$  confirms  $H [(\forall x)(Rx \supset Bx)]$  *relative to*  $T$ , but  $E$  doesn't confirm  $H$  relative to some (nontautological)  $K \neq T$ .
- *Which*  $K \neq T$ ? Later, Hempel discusses  $K = \sim Ra$ . Intuition: if you already know that  $a$  is a nonraven, then observing its color will not tell you anything about the color of ravens. Hempel: (PC) is true, but (PC\*) is false:
  - (PC)  $\sim Ra \ \& \ \sim Ba$  confirms  $(\forall x)(Rx \supset Bx)$ , relative to  $T$ .
  - (PC\*)  $\sim Ra \ \& \ \sim Ba$  confirms  $(\forall x)(Rx \supset Bx)$ , relative to  $\sim Ra$ .
- This is a good insight! Unfortunately, it is *logically incompatible* with the (deductive) confirmation *theories* that Hempel and Goodman accept.
- Specifically, this possibility contradicts the *K-monotonicity* property:

(M<sub>K</sub>)  $E$  confirms  $H$ , relative to  $T \Rightarrow E$  confirms  $H$  relative to *any*  $K$  (provided that  $K$  does not mention any individuals not already mentioned in  $E$ ).

- Because Hempel's theory of confirmation satisfies (M), his theory implies that (PC) entails (PC\*). So, it is logically impossible for Hempel's theory to undergird his suggestion that (PC) is true, while (PC\*) is false.
- This is bad news for Hempel/Goodman. Surprisingly, nobody noticed this inconsistency in the Hempel/Goodman approach to the paradox.
- As we will see shortly, *Bayesians* can better accommodate Hempel's intuitions here, since *their* theory of confirmation does *not* satisfy (M).
- Interestingly, later in this very same passage, Hempel offers an argument for premise (1) which, itself, *depends on* this very monotonicity property!  
 If ...  $E$  consists *only* of one ... nonraven [ $\sim Ra$ ], then  $E$  ... confirm[s] that all objects are nonravens [ $(\forall x) \sim Rx$ ], and *a fortiori*  $E$  supports the weaker assertion that all nonblack objects are nonravens [ $(\forall x)(\sim Bx \supset \sim Rx)$ ].
- The dependence on (M) is almost invisible here! My conjecture: (M) is a vestige of "objectual" ways of thinking about confirmation (like NC<sub>0</sub>).

- This independent argument for (1) presupposes not only (M), but (SCC):  
(SCC)  $(\forall E)(\forall H_1)(\forall H_2)[E \text{ confirms } H_1 \text{ and } H_1 \models H_2 \Rightarrow E \text{ confirms } H_2]$ .
- To see this, take a closer look at the reasoning of the argument:
  - (1.1)  $\sim Ra$  confirms  $(\forall x)\sim Rx$ . (Nicod)
  - (1.2)  $(\forall x)\sim Rx \models (\forall x)(\sim Bx \supset \sim Rx)$  (Logic)
  - (1.3)  $\sim Ra$  confirms  $(\forall x)(\sim Bx \supset \sim Rx)$  (SCC)
  - (1)  $\sim Ra \ \& \ \sim Ba$  confirms  $(\forall x)(\sim Bx \supset \sim Rx)$  (M?!)
- (M) and (SCC) are consequences of Hempel's (and Goodman's) confirmation theory, which says  $E$  confirms  $H$  iff  $E \models \text{dev}_E(H)$ .
- Modern Bayesians *reject both* (M) *and* (SCC). And, as a result, Bayesians are able to say what Hempel wanted to say (but can't!).
- Before Bayesianism, we'll look briefly at Scheffler [who accepts (NC), but denies (EC)], and Quine [who accepts (EC), but denies (NC)].
- Then, we'll look at Bayesian resolutions of several different kinds. Some of these will reject (NC), while others will take a different tack.

- Scheffler rejects (PC), but accepts (1). He denies (EC). He proposes:  
 (\*) A Hempelian positive instance ( $E$ ) of a  $\forall$ -hypothesis ( $H$ ) confirms  $H$ ,  
*unless  $E$  is also a positive instance of the contrary ( $H'$ ) of  $H$ .*
- Let  $H: (\forall x)[Rx \rightarrow Bx]$ . The contrary of  $H$  is  $H': (\forall x)[Rx \rightarrow \sim Bx]$ . Let  
 $E: \sim Ra \ \& \ \sim Ba$ .  $E$  is a Hempelian positive instance of  $H$ , *and*  $H'$ .
- Thus, according to Scheffler's (\*),  $E$  does not confirm  $H$  after all.
- Scheffler accepts (1) [and (NC)].  $E$  confirms  $H^*: (\forall x)[\sim Bx \rightarrow \sim Rx]$  —  
*even according to (\*)*. This is because  $E$  is *not* a Hempelian positive  
 instance of the *contrary* of  $H^*$ ,  $H^{*'}: (\forall x)[\sim Bx \rightarrow Rx]$ .
- This leads to a violation of (EC), of course, since – according to (\*) –  $E$   
 confirms  $H^*$ , but  $E$  does not confirm  $H$  — even though  $H \models H^*$ .
- Is Scheffler's (\*) true? **Exercise:** show that Scheffler's (\*), and (NC) are  
 both *false* from the point of view of PR-theory. I'll return to this when  
 we discuss I.J. Good and (NC). This will be one of the many subtle (and  
 non-Hempelian) aspects of probabilistic relevance accounts of  $c$ .