

Explanatory Coherence and the Impossibility of Confirmation by Coherence

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The coherence of independent reports provides a strong reason to believe that the reports are true. This plausible claim has come under attack from recent work in Bayesian epistemology. This work shows that, under certain probabilistic conditions, coherence cannot increase the probability of the target claim. These theorems are taken to demonstrate that epistemic coherentism is untenable. To date no one has investigated how these results bear on different conceptions of coherence. I investigate this situation using Thagard's ECHO model of explanatory coherence. Thagard's ECHO model provides a natural representation of the evidential significance of multiple independent reports.

The idea that the coherence of a body of information provides a reason for that information has a long history. An early use of coherence reasoning comes from Carneades, described by Sextus Empiricus as follows: "Just as some doctors detect the genuine fever patient not from one symptom, such as an excessive pulse or a severe high temperature, but from a cluster [of symptoms], such as a high temperature as well as pulse and soreness to the touch and flushing and thirst and similar things, so too the Academic makes his judgment as to the truth by a cluster of appearances" (2005, 37).

Carneades's point is that judgment should be responsive to a mass of evidence, not to a single isolated report. Meinong provides the following analogy of how coherence functions: "One may think of playing cards. No one of them is capable of standing by itself, but several of them, leaned against each other, can serve to hold each other up" (1915, 465). Meinong's analogy suggests that a coherent body of information may provide reasons even though each item alone does not provide a reason.

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The intuition that coherence is a unique source of justification is widespread. Even so, a common objection is that this intuition requires an account of the nature of coherence, and no account is forthcoming. Ewing channels this complaint, writing that apart from an account of coherence, the theory is “reduced . . . to be mere uttering of a word, coherence, . . . rob[bing] it of almost all significance” (1934, 246). Ewing’s complaint about the nature of coherence remains relevant. Even though there have been formal accounts of the nature of coherence, there is no settled view about its nature (see Roche 2013). But formal epistemology has made progress on the epistemology of coherence. Recent Bayesian results have shown that coherence cannot provide confirmation unless individual evidence itself provides confirmation. These results are taken to be bad news for coherentism. Olsson explains, “Coherence cannot generate credibility from scratch when applied to independent data. Some reports must have a degree of credibility that is prior to any consideration of coherence, or such agreement will fail to have any effect whatsoever on the probability of what is reported” (2005, 69).

These results are within Bayesian models. No one has investigated how these results bear on alternative models of coherence. In this article I use Thagard’s (2000) ECHO model of coherence to model the witness agreement scenarios centrally at issue in the Bayesian coherence literature. I show that Thagard’s ECHO model captures the natural judgment that isolated reports fail to confirm whereas multiple reports do confirm. I then discuss differences between ECHO models and Bayesian models.

1. Witness Agreement and the Impossibility of Coherence. I here review the witness agreement model and the impossibility results.

1.1. The Witness Agreement Model. The Bayesian coherence literature picks up on Lewis’s (1946) model of coherence justification. Lewis’s key observation is that coherence is best seen in the case in which multiple witnesses report the same event. When the witnesses are independent, he claims the agreement of the reports provides a powerful reason to accept the report. Lewis explains, “Imagine a number of relatively unreliable witnesses who independently tell the same circumstantial story. For any one of these reports, taken singly, the extent to which it confirms what is reported may be slight. And antecedently, the probability of what is reported may also be small. But the congruence of the reports establishes a high probability of what they agree upon” (346).

Lewis’s model takes coherence to be agreement in content. Two reports cohere when they report the same event. Lewis holds that coherence is epistemically powerful when (i) the reports are independent and (ii) individually the reports have some positive, but small, bearing on the content of the claim. Under these conditions Lewis thinks the coherence of the reports

bestows a significant probability on the claim thus supported, even if a single report has little effect.

BonJour picks up on Lewis's witness argument model in his defense of epistemic coherentism. BonJour claims that the coherence of witness reports is powerful even if each report, on its own, has no probabilistic effect. He writes, "What Lewis does not see, however, is that his own example shows quite convincingly that no antecedent degree of warrant or credibility is required. For as long as we are confident that the reports of the various witnesses are genuinely independent of each other, a high enough degree of coherence among them will eventually dictate the hypothesis of truth telling as the only available explanation of their agreement" (BonJour 1985, 148).

BonJour posits that the positive bump in credence that any individual report provides is not essential to the power of coherence. If the reports are independent from one another, then coherence alone provides a powerful reason that the reports are true. BonJour's thought is twofold: (i) rational belief is not moved by individual reports, but (ii) rational belief is moved by the coherence of the individual testimonies.

1.2. Huemer's Anticoherence Theorem. Whether BonJour is right is a crucial question for the viability of coherentism. Can coherence increase the justification of a body of claims without first requiring that those claims have some justification independent of coherence? Huemer (1997) attempts to answer this by interpreting BonJour's intuition as formal constraints on probabilistic models. I briefly explain Huemer's theorem and its purported significance.

Let us begin with terminology. Let $W_{i,A}$ indicate that witness i reports A . BonJour's claim that the witness reports need no antecedent degree of credibility may be understood thusly:

$$\text{No Cred: } P(A \mid W_{i,A}) = P(A).^1$$

In contrast Lewis's model assumes that the witness reports have some small degree of credibility. That is,

$$\text{Cred: } P(A \mid W_{i,A}) > P(A).$$

In these claims, and throughout the article, we should understand probability as rational credence (see Maher 2006, 2010). No Cred specifies that a single witness report does not move rational credence. The idea is that if one lacks

1. This condition should be read "for any witness i the prior probability of A is unmoved by i 's report that A ." The other conditions below should be read similarly.

any relevant information about whether the witnesses report truthfully then one should not change one's credence in the claim thus reported.

The next feature of BonJour's intuition is that the witnesses are genuinely independent of each other. If so, BonJour claims that the coherence of their reports provides a powerful reason to believe that the reports are true. This is modeled in terms of conditional independence. This is,

Conditional Independence:

1. $P(W_{j,A} \mid W_{i,A} \wedge A) = P(W_{j,A} \mid A)$.
2. $P(W_{j,A} \mid W_{i,A} \wedge \neg A) = P(W_{j,A} \mid \neg A)$.

Conditions 1 and 2 specify that one's credence that j will report A is responsive to A or $\neg A$. We would expect this for witnesses who are causally independent of each other.²

BonJour's intuition is then interpreted thus: under the conditions of no-individual credibility and conditional independence, the agreement of multiple witness reports provides powerful evidence that the reports are true. That is,

BonJour's Formal Intuition: It is possible that $P(A \mid W_{i,A} \wedge W_{j,A}) > P(A)$ even if (i) $P(A \mid W_{i,A}) = P(A)$, (ii) $P(A \mid W_{j,A}) = P(A)$, and (iii) the reports are conditionally independent.

BonJour's intuition, thus formalized, conflicts with a theorem of probability that, under these conditions, the agreement of multiple reports does not change the relevant prior probability.

Huemer's Theorem: $P(A \mid W_{i,A} \wedge W_{j,A}) = P(A)$ when (i) $P(A \mid W_{i,A}) = P(A)$, (ii) $P(A \mid W_{j,A}) = P(A)$, and the reports are conditionally independent.

Huemer's theorem is easily proved from two consequences of No Cred. First, No Cred implies that learning A occurs does not change one's credence that witness i testifies that A . That is,

$$P(A \mid W_{i,A}) = P(A) \Leftrightarrow P(W_{i,A} \mid A) = P(W_{i,A}). \quad (1)$$

Equation (1) is expected when one lacks any knowledge about whether witness i tracks A . If one's prior credence in A is unmoved by a report that A , then one ought to think that independently learning A does not change one's

2. See Olsson (2002, 262) on the reasons for conditional independence.

credence that i reports A . Similarly, if learning that A does not change one's prior credence that i reports A , then learning that i reports A does not change one's credence that A . Equation (1) implies that i 's report that A is like background noise with respect to A .

Second, No Cred implies one's credence that i reports A is the same given A or $\neg A$. That is,

$$P(A \mid W_{i,A}) = P(A) \Leftrightarrow P(W_{i,A} \mid A) = P(W_{i,A} \mid \neg A). \quad (2)$$

A natural way to understand equation (2) is that individual witness reports are not responsive to the relevant facts. Rather the relationship between the individual reports and the relevant facts is the same as the relationship between individual flips of a fair coin.

Given (1) and (2), Huemer's theorem is easily proved. Olsson (2005) provides a fuller discussion of the impossibility results. Olsson extends Huemer's negative results to models that include multiple hypotheses about witness reliability. Huemer (2011) finds a different set of probabilistic conditions that is compatible with confirmation by coherence, but these conditions require abandoning both conditional independence and no-individual credibility. Olsson (2017) argues that coherence should be explicated in terms of conditional independence and no-individual credibility. In the following section I explore Thagard's ECHO model of the power of multiple coherent witness reports.

2. Coherence Maximization Model. Let us examine the witness agreement conception of coherence within Thagard's (2000) puzzle-solving conception of coherence. We start with the idea that a given set of propositions may stand in either positive or negative coherence relations to each other, although some propositions may be unrelated. Coherence relations are understood in terms of the following principles:

E1: Symmetry. Explanatory coherence is a symmetric relation.

E2: Explanation. (a) A hypothesis coheres with what it explains, which can either be evidence or another hypothesis; (b) hypotheses that together explain some other proposition cohere with each other; and (c) the more hypotheses it takes to explain something, the lower the degree of coherence.

E3: Analogy. Similar hypotheses that explain similar pieces of evidence cohere.

E4: Data Priority. Propositions that describe the results of observations have a degree of acceptability on their own.

E5: Contradiction. Contradictory propositions are incoherent with each other.

- E6: Competition.** If p and q both explain a proposition, and if p and q are not explanatorily connected, then p and q are incoherent with each other (p and q are explanatorily connected if one explains the other or if together they explain something).
- E7: Acceptance.** The acceptability of a proposition in a system of propositions depends on its coherence with them (Thagard 2000, 43; see also Thagard 1989; Thagard and Verbeurgt 1998).

The puzzle-solving conception of coherence starts with a body of claims that are coherent and incoherent in various ways and attempts to determine a scoring rule that will guide which subset of these claims should be accepted and which rejected. I layout a general approach to a coherence problem that explains the foundations of ECHO model without appealing to Thagard's specific neural network algorithm.³

We begin with the idea that coherence and incoherence is a two-place relation between propositions. The coherence of a body of information is maximized when the positive and negative constraints are maximized. A positive explanatory constraint between two propositions is satisfied when both propositions are accepted. A negative explanatory constraint between two claims is satisfied when one is accepted and the other is rejected.

Let us examine how this works in a simple model. Consider a set of information that consists of two reports e_1 and e_2 and two hypotheses h_1 and h_2 that offer competing explanations of the evidence. We then have the following set of information: $\{e_1, e_2, h_1, h_2\}$. Hypotheses h_1 and h_2 contradict each other. Hypothesis h_1 explains e_1 and e_2 , while h_2 explains only e_2 . We then characterize a set of positive constraints and a set of negative constraints. The set of positive constraints is this: $C^+ = \{(e_1, h_1), (e_2, h_1), (e_2, h_2)\}$. The set of negative constraints is this: $C^- = \{(h_1, h_2)\}$. Our coherence problem is then to find a partition of E into accepted claims and rejected claims that satisfies the most constraints.

We can represent this information in terms of an undirected graph (see fig. 1). The solid lines between nodes represent a positive explanatory constraint. The dotted line represents a negative explanatory constraint.

A simple coherence problem.—What partition of E has the highest coherence score? Because E has four propositions, there are $2^4 = 16$ partitions of E into accepted and rejected items. Examine two partitions. First, consider a partition that accepts h_2 and e_2 and rejects h_1 and e_1 . This is $P_1 : A = \{h_2, e_2\}; R = \{h_1, e_1\}$. Partition P_1 satisfies one positive explanatory constraint in virtue of accepting h_2 and e_2 , and it satisfies one negative

3. For his neural network algorithm, see Thagard (2000, 30–34).

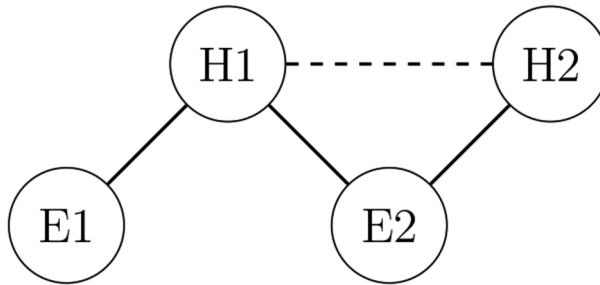


Figure 1.

explanatory constraint in virtue of accepting h_2 and rejecting h_1 . Partition P_1 has an explanatory coherence score of 2.

Partition P_1 rejects e_1 and h_1 , thus leaving the positive constraint between those claims unsatisfied. Consider a different partition $P_2 : A = \{h_1, e_1, e_2\}$; $R = \{h_2\}$. Partition P_2 satisfies two positive explanatory constraints by accepting h_1 , e_1 , and e_2 . It also satisfies the negative constraint by accepting h_1 and rejecting h_2 . It has a higher coherence score than P_1 . By inspection of the 16 partitions we see that P_2 has the highest coherence score. Hence, we have most reason to accept h_1 , e_1 , and e_2 and reject h_2 .

This coherence maximization process can be done by exhaustive search among the 2^n partitions for n elements. For each partition, sum all the satisfied constraints. If a partition's sum is greater than the sum of each other partition, one has most reason to accept its accepted elements and reject its rejected elements. The representation of constraints can be made finer by adding weights to the positive and negative constraints. Also, if some evidential statements have special significance this can be modeled in terms of an item of evidence label 'special'. It then becomes a positive constraint that enters into the overall coherence score.

Thagard's ECHO model differs from this coherence maximization model only in terms of its efficiency in handling a large number of propositions and constraints. The algorithm he uses is designed to efficiently find the partition with the highest score. But while ECHO has the advantage of modeling a large number of constraints, it is not guaranteed to find the partition with the highest score. Furthermore, in the applications of coherence reasoning that drive our interest we can work with the simpler exhaustive search procedure.

3. Coherence Maximization and Witness Agreement Models. How does this coherence maximization method model a witness agreement scenario? I begin with the case of a single isolated report and then turn to multiple witness reports.

3.1. *A Single Isolated Report.* The coherence maximization method begins with a body of evidence and adds potential explanations to that body of evidence. Let us apply this to a single witness of unknown reliability who reports A . Our lack of knowledge of W 's reliability includes any background information that would provide reason that the witness is more or less reliable. Consider two explanations of W 's report that A . The first explanation is that the report is true and the witness is reliable on these matters. To simplify things, I represent this conjunctive explanation as the single hypothesis that the witness is truthful. I use 'truthful' in a technical sense of 'being reliable and reporting the truth'. The second explanation is that the report is false and that the witness is misleading on these matters. Again to simplify things, let us represent this conjunctive explanation as the single hypothesis that the witness is misleading. We have the following explanatory relations: (i) that W is truthful explains why W said A ; (ii) that W is misleading explains why W said A ; (iii) the two explanations compete with each other.

Single-Witness Model.

EVIDENCE

E1. W reports that A .

HYPOTHESES

H1. W is truthful.

H2. W is misleading.

EXPLANATIONS

X1. H1 explains E1.

X2. H2 explain E1.

COMPETES

C1. H1 conflicts with H2.

Our set of information here is $E = \{e_1, h_1, h_2\}$. The positive constraints are $C^+ = \{(e_1, h_1), (e_1, h_2)\}$, and the negative constraints are $C^- = \{(h_1, h_2)\}$. There are 2^3 possible partitions but only 2^2 that include e_1 . Since we cannot accept both h_1 and h_2 , we can rule out that partition, and the partition in which both explanations are rejected will not satisfy any positive explanatory constraints. We are left with two partitions.

1. $P_1 : A = \{e_1, h_1\}; R = \{h_2\}$. (Coherence score = 2.)
2. $P_2 : A = \{e_1, h_2\}; R = \{h_1\}$. (Coherence score = 2.)

This coherence maximization model does not favor either hypothesis. This result shows that an isolated report by a witness of unknown reliability does not favor either the truth-telling hypothesis or the misleading hypothesis. It is natural to understand this result as indicating that one's credence that *A* is unmoved by a single isolated report. This is precisely what would be expected given that we do not know anything about the reliability of the witness.

3.2. Multiple Witness Reports. In the single-witness case, ECHO shows there is no reason to place more confidence in the report than otherwise. The situation changes dramatically with multiple witness reports. The evidential situation with multiple witness reports is much richer than the single-witness case.

Let us describe this situation. We start with two witnesses who both report that *A*. Our evidence includes "W1 reports that *A*" and "W2 reports that *A*." We thereby have as evidence that "W1 and W2 report the same event." BonJour's intuition included that the witnesses are independent. We need not add this assumption at the level of evidence; rather we add as evidence that "W1 and W2 have no observed contact."

We have this evidence set.

EVIDENCE

- E1. W1 reports that *A*.
- E2. W2 reports that *A*.
- E3. W1 and W2 report the same event.
- E4. W1 and W2 have no observed contact.

We immediately see a difference in evidence between a single witness report and multiple witness reports. There are, of course, more reports. But of greater significance, there is the evidence that the reports agree and that the witnesses do not appear to have coordinated their reports. These differences also expand the range of explanatory hypotheses.

What is the hypothesis space for multiple witness reports? As with a single witness report, we have two hypotheses corresponding to whether the witness is truthful or misleading as understood in the technical sense given above. Also, we consider the hypothesis that the witnesses are independent from each other and the competing hypothesis that the witness are colluding. We have the following hypothesis space.

HYPOTHESES

- H1. W1 is truthful.
- H2. W1 is misleading.
- H3. W2 is truthful.
- H4. W2 is misleading.

- H5. W1 and W2 are independent.
- H6. W1 and W2 are colluding.

Next we specify the positive explanatory relationships.

EXPLANATIONS

- X1. H1 explains E1.
- X2. H2 explains E1.
- X3. H3 explains E2.
- X4. H4 explains E2.
- X5. H1 and H3 and H5 explain E3.
- X6. H2 and H4 and H6 explain E3.
- X7. H5 explains E4.

That W1 is truthful explains why she said *A*. That the witnesses are both truthful together with the fact that they are independent explains why they reported the same event. Moreover, the hypothesis that the witnesses are independent explains why we do not observe any contact between them. The hypothesis of independence figures in two explanations of the evidence. Further, the hypotheses that the witnesses are misleading does not explain the evidence that the witnesses report the same thing. To get an explanatory connection, we must introduce an additional hypothesis that the witnesses are colluding (i.e., H6). But note that H6 is in tension with our evidence that the witnesses have no observed contact.

The negative explanatory relations are as follows.

CONTRADICTIONS

- C1. H1 conflicts with H2.
- C2. H3 conflicts with H4.
- C3. H5 conflicts with H6.

The model for multiple witness reports is much richer than a single witness report. We have more evidence and more hypotheses. Let us work out how the ECHO model issues a verdict about which partition of the information set has the highest coherence score. Recall that the information set consists of the evidence and the potential explanations. In the multiple-witness model we have this information set:

$$E = \{e_1, e_2, e_3, e_4, h_1, h_2, h_3, h_4, h_5, h_6\}.$$

Given our characterization of positive and negative explanatory constraints, we have the following sets of constraints:

$$C+ = \{(e_1, h_1), (e_1, h_2), (e_2, h_3), (e_2, h_4), (e_3, h_1), (e_3, h_3), (e_3, h_5), (h_1, h_3), (h_1, h_5), \\ (h_3, h_5), (e_3, h_2), (e_3, h_4), (e_3, h_6), (h_2, h_4), (h_2, h_6), (h_4, h_6), (e_4, h_5)\}.$$

I leave it to the reader to verify that each element of $C+$ tracks a positive explanatory constraint. We have the following negative constraints:

$$C- = \{(h_1, h_2), (h_3, h_4), (h_5, h_6)\}.$$

Given E , $C+$, and $C-$, our task is whether there is a partition with the highest coherence score. An exhaustive search algorithm would consider each of the $2^{10} = 1,024$ partitions and determine whether one has the highest coherence score. We can apply heuristics to reduce the number of partitions. One heuristic considers only partitions that accept all the evidence statements. This leaves us with 2^6 partitions. We can further trim the space of partitions by considering the set of negative constraints. We see that satisfying the negative constraints requires accepting exactly one of h_5, h_6 . We can then look to see whether one of these hypotheses stands in more positive relations than the other. By inspection, we see that h_5 explains e_4 , and h_6 does not. Otherwise, h_5 and h_6 stand in the same number of explanatory relations. Thus, we consider the partition that accepts all the evidence, h_5 , and all other claims that bear positive relations to h_5 . We thus get this partition:

$$P^* : A = \{e_1, e_2, e_3, e_4, h_5, h_3, h_1\}; R = \{h_2, h_4, h_6\},$$

where P^* has a coherence score of 12. By inspection, no partition has a higher coherence score. This model suggests that given the information set E we have the most reason to accept that the witnesses are truthful.

3.3. Discussion. The ECHO model of multiple witness reports fits Bonjour's original intuition that, while an isolated report does not confirm the content of the report, multiple independent witness reports do confirm the report. Why does the ECHO model differ from the Bayesian model with respect to the power of coherence? To answer this question let us describe another witness agreement case in which both a Bayesian model and ECHO model are in agreement.

Coin-Flipping Witnesses: Suppose there is a pair of witnesses, Tim and Tam, who will observe an event, E , and will report either E or not E . Tim and Tam, though, will issue their individual reports by each flipping a fair coin. If the coin lands heads then report E ; otherwise report not E . Both Tim and Tam flip a coin, and it lands heads for both. They both report E .

It is clear that the coherence of Tim's report and Tam's report does not provide any reason to think that E is true. This case satisfies the assumptions

of no-individual credibility and conditional independence. No-individual credibility requires that $P(E \mid \text{Tim}_E) = P(E)$ and $P(E \mid \text{Tam}_E) = P(E)$, where ‘ Tim_E ’ and ‘ Tam_E ’ are that Tim reports E and Tam reports E . Conditional independence is this claim: $P(\text{Tim}_E \mid E \& \text{Tam}_E) = P(\text{Tim}_E \mid E)$ (mutatis mutandis, for Tam’s report that E). Here the Bayesian model delivers precisely the correct verdict. The agreement of Tim’s report and Tam’s report provides no reason to believe E .

An ECHO model of the coin-flipping witnesses does not include the hypotheses that the witnesses are truthful because the setup rules out the possibility that the reports are generated by truth-telling. Rather the relevant explanatory hypothesis for the reports is whether the individual coins landed heads. Accordingly, the ECHO model is as follows:

EVIDENCE

- E1. Tim reports that E .
- E2. Tam reports that E .
- E3. Tim and Tam report the same event.

HYPOTHESES

- H1. Tim’s coin lands heads.
- H2. Tam’s coin lands heads.
- H3. Tim’s coin lands tails.
- H4. Tam’s coin lands tails.

EXPLANATIONS

- X1. H1 explains E1.
- X2. H2 explains E2.
- X3. H1 and H2 explain E3.

CONTRADICTIONS

- C1. H1 conflicts with H3.
- C2. H2 conflicts with H4.
- C3. H3 conflicts with E1.
- C4. H4 conflicts with E2.

The reader can verify that the partition with the highest coherence score accepts H1 and H2 and rejects H3 and H4. The key is that H3 and H4 conflict with the evidence while H1 and H2 explain the evidence. Of special note is that no hypothesis in this ECHO model invokes the truth or falsity of E , and hence no verdict of this model is relevant to whether E is true.

The crucial difference between the coin-flipping ECHO model and the witness agreement ECHO model lies here. In the coin-flipping model, there are no hypotheses pertaining to witness reliability and no hypotheses that

bear on the truth of E . But in the witness agreement model, there are such hypotheses. In the coin-flipping case, agreement does not indicate that the witnesses are reliable, but in the witness agreement case it does indicate that the witnesses are reliable. This crucial difference is omitted in the Bayesian models, assuming that no-individual credibility holds both in the single-witness case and in the multiple-witness case. That is, it is a constraint on the Bayesian models that $P(A | W_{i,A}) = P(A)$ for each witness i , and this holds for both the single-witness case and the multiple-witness case. Using ECHO, though, we treat the single case differently from the case involving multiple witnesses. In the single case the evidence and the explanatory hypotheses do not give us any reason to think that A is more likely to be true than not. But in the multiple-witness case the evidence and explanatory hypotheses do provide us reason to think that the witnesses are reporting the truth.

The upshot of this discussion is that the assumption of no-individual credibility is too strong in the Bayesian models. The effect of coherence in the multiple-witness case involves changing one's relevant conditional probabilities. Before learning that there are multiple witness reports in agreement, one's conditional probability that a claim is true given a single witness report is the same as the probability of the report. But after learning that independent witnesses report the same event, one is rationally moved to favor the hypothesis that the witnesses are telling the truth, and in that case the assumption of no-individual credibility is false. The surprising agreement is best explained by the otherwise surprising claim that the witnesses are individually credible.⁴

4. Conclusion. Bonjour's original intuition is robust. I have argued that while a Bayesian model of this case conflicts with the intuition, Thagard's ECHO model is able to capture it. Moreover, reflection on the difference between ECHO models and Bayesian models reveals a crucial assumption in Bayesian models that conditional probabilities relating to a witnesses credibility cannot change in response to the evidence that multiple witnesses report the same event.

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4. This feature of the Bayesian model is related to the assumption of rigidity, that conditional probabilities are unchanged by the evidence. For a discussion of rigidity and its connection to holism, see Weisberg (2009, 2015).

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