The following questions pertain to various topics discussed in some detail in the chapters from Earman's *Bayes or Bust?* Mainly, these questions involve issues surrounding Bayesian confirmation theory.

1. Compare and contrast the following four accounts of confirmation that we have covered in the class:

   (a) Hypothetico-Deductive (H-D) confirmation

   (b) Hempel's instantial theory of confirmation

   (c) Absolute Bayesian confirmation

   (d) Incremental Bayesian confirmation

   Your comparison should involve a discussion of the following eight (8) properties.

   (i) (non-triviality) For all H, there is an E such that E does not confirm H.

   (ii) (consistency) If E confirms both H and H', then H and H' must be logically consistent.

   (iii) (entailment) If $E \vDash H$, then E confirms H.

   (iv) (converse entailment) If $H \vDash E$, then E confirms H.

   (v) (converse consequence) If E confirms H and $H' \vDash H$, then E confirms H'.

   (vi) (special consequence) If E confirms H and $H \vDash H'$, then E confirms H'.

   (vii) (transitivity) If X confirms Y and Y confirms Z, then X confirms Z.

   ($viii$) (symmetry) If X confirms Y, then Y confirms X.

   Ideally, one should produce a 4×8 table (with accompanying proofs![1]) that shows which of the four accounts of confirmation satisfy which of the eight properties.

2. It's been suggested that when a hypothesis has applications in several domains (*e.g.*, for tides, pendulums, planetary motion, and so on, for Newtonian theory), then confirmatory evidence from more of the domains supports the hypothesis better than does confirmatory evidence from fewer of the domains. Can this idea be supported by the Bayesian conception of evidence? Earman discusses this issue in *Bayes or Bust?* (see pages 77–79). For some other suggestions and approaches (as well as criticisms), see my paper "Wayne, Horwich, and Evidential Diversity" in *Philosophy of Science* volume 63, pages 652-660 (1996), and references contained therein (*e.g.*, Horwich's 1982 book *Probability and Evidence*).

3. Explain and evaluate a Bayesian approach either to the raven paradox or to the grue puzzle. For the ravens paradox, see pages 69–73 of Earman's *Bayes or Bust?*, pages 52–64 of Eells' *Rational Decision and Causality*, Rosenkrantz's "Does the Philosophy of Induction Rest on a Mistake?" and the references contained in each.[2] For Grue, see chapter IV of Skyrms' *Choice and Chance*, pages 104–113 of Earman's *Bayes or Bust?*, pages 52–64 of Eells' *Rational Decision and Causality*, Rosenkrantz's "Does the Philosophy of Induction Rest on a Mistake?" and the references contained in each.[3]

4. Very roughly, hypothetico-deductivism (H-D) is the idea that theoretical hypotheses are confirmed by their observational deductive consequences. Thus, if hypothesis H logically implies observational E, then E confirms H. But if H logically implies E, then so does $H \& G$, for any other hypothesis G (even if G is utterly irrelevant to H and E), so that E confirms $H \& G$ as well. This has become known as the "problem of irrelevant conjunction" or the "tacking problem". Earman (pages 64 and 119) briefly

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[1]Some of the proofs are trivial, and some of the results can be proved in "bunches," because there are logical relationships between some the properties. For instance, several useful relationships are discussed in paper topics set #2 (question #2).

[2]For the ravens paradox, you may find the discussion in Paul Horwich's 1982 book *Probability and Evidence* useful.

[3]For Grue, you may also find the following paper valuable: Sober, E. (1994), "No model, No Inference: A Bayesian Primer on the Grue Problem", in D. Stalker, (ed.), *Grue! The New Riddle of Induction.* Chicago: Open Court, 225-240.

discusses this problem, and proposes a Bayesian resolution of it. It seems to me that this resolution is of limited applicability, since (1) it only applies to the case of deductive evidence (in which $H \vDash E$), and (2) it does not make use of the "irrelevance" of the conjunct G (*i.e.*, the argument goes through for *ALL* conjuncts G — even *highly relevant* ones!). Try to formulate a more general Bayesian analysis of the role of irrelevant conjuncts. To do so, you should first (a) say what it *means* for G to be *irrelevant* to H and E (from an incremental Bayesian point of view), then (b) try to show that adding *irrelevant* conjuncts lead to decreased degree of confirmation on an incremental Bayesian approach. You will have to assume some *measure* of degree of incremental confirmation here. For a survey of some popular measures of degree of incremental confirmation and their properties, see my paper "The Plurality of Bayesian Measures of Confirmation and the Problem of Measure Sensitivity", *Philosophy of Science*, volume 66 (supplement for the proceedings of the *PSA '98* conference), pages S362–S378.[4]

5. In chapter 5 of *Bayes or Bust?*, Earman has an extensive discussion of the so-called "problem of old evidence." This is a problem that is peculiar to incremental Bayesian confirmation theory. Many papers have been written about this problem in recent years, and everybody seems to have an opinion about it. There are many things one can do here. Here are several ideas for papers on this problem. The most comprehensive paper on this problem is Ellery Eells' "Problems of Old Evidence", *Pacific Philosophical Quarterly*, LXVI (1985). That is a *must read*, if one chooses this topic!

   - Explain and evaluate one of the several proposed resolutions Earman considers. Which proposal (if any) do you think is most promising? Can you think of an alternative way out of this problem?

   - Discuss the recent proposal made by Ellery Eells and myself, in our paper "Measuring Confirmation and Evidence", *Journal of Philosophy*, volume XCVII, number 12 (December 2000). How does our account differ from the "counterfactual" account and/or the "historical" account discussed in Earman's chapter 5, and (in more detail) in Eells (1985) "Problems of Old Evidence"?[5].

   - On page 121, Earman discusses, and abruptly rejects an "easy way out" of the problem of old evidence. This way out suggests that Bayesians should never assign probability 1 to any empirical proposition, including observation or evidence reports. Since the traditional problem of old evidence only arises if Bayesians assign probability 1 to (previously learned) evidence reports (*why?*), this is an "easy way" for Bayesians to simply sidestep the problem of old evidence. Earman concedes that this would avoid the original (qualitative) problem of old evidence. But, he claims that even if this strategy were adopted, there would still remain a *quantitative* problem of old evidence. Earman assumes that the *degree* to which E confirms H should be gauged using the *difference measure* $d(H, E) = \Pr(H \mid E) - \Pr(E)$. Then, Earman (correctly) points out that (in the case of deductive evidence, in which $H \vDash E$) if $\Pr(E) \approx 1$, then $d(H, E) \approx 0$. That is, if (deductive) evidence E is *highly probable* then E can *only very weakly confirm H*, according to the difference measure d. In footnote 8 on page 121 (see page 243), Earman suggests that similar problems would also arise for *alternative* measures $\mathfrak{c}(H, E)$ of the degree to which E incrementally confirms H. In particular, Earman claims that Gaifman's measure $g(H, E) = \frac{\Pr(\sim H)}{\Pr(\sim H \mid E)}$ also suffers from the quantitative problem of (deductive) old evidence. Is this correct? Also, ask yourself whether the *likelihood-ratio* measure $l(H, E) = \frac{\Pr(E \mid H)}{\Pr(E \mid \sim H)}$ has this shortcoming. Is Earman's dismissal too hasty? Also, ask yourself what happens in the more general case in which $H \nvDash E$. Does this more general analysis even further suggest that Earman has unfairly rejected this "easy way out"?

Note: You may find my dissertation *Studies in Bayesian Confirmation Theory* useful for some of these questions. It can be downloaded from my website, at: `http://philosophy.wisc.edu/fitelson/thesis.pdf`.

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[4]This paper of mine can be downloaded from my website, at: `http://philosophy.wisc.edu/fitelson/wayne.pdf`.
[5]Our paper can be downloaded from my website, at: `http://philosophy.wisc.edu/fitelson/dccfin.pdf`