

# Understanding ‘probably’ (as updated Feb. 22, 2010)

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## Table of Contents

1. INTRODUCTION.....	1
2. REASONS AND REASONING: PROPOSITIONAL ATTITUDES AND MODAL QUALIFIERS .....	2
2.1 Reasons and reasonableness .....	2
2.2 Reasoning.....	3
2.3 The role of epistemic modal qualifiers.....	4
3. THE FORCE OF ‘PROBABLY <i>P</i> ’ – REASONABLE EXPECTATION .....	5
4. “QUALIFIED” BELIEF AND/OR ACCEPTANCE .....	6
5. EXPECTING THAT <i>P</i> .....	8
6. THE ROLE OF THE <i>POSSIBLE</i> AND THE <i>PROBABLE</i> IN DELIBERATION .....	10
7. PROBABILITY AND RELATIVE FREQUENCY .....	13
8. NUMERIC OR METRIC CONCEPTS OF <i>EPISTEMIC</i> PROBABILITY .....	14
8.1 Objective probability and <i>epistemic</i> probability .....	15
8.2 “Bayesian” accounts of numeric probability.....	18
8.3 Pluralism .....	18
9. CONCLUSION .....	19
APPENDIX: Sellars On Probability and Induction.....	20
ACKNOWLEDGEMENTS .....	22
NOTES.....	23
REFERENCES.....	31

*Abstract:* Following Wilfrid Sellars I argue that, in a basic epistemic sense of probable (in relation to which other epistemically normative senses are to be understood), to say that a proposition is probable is to say that all things considered there is good reason to adopt a positive doxastic attitude toward it. However, where Sellars took the positive doxastic attitude toward *P* at issue to be *accepting P*, I argue that we ought to take it to be *expecting that P will turn out to be the case*. Moreover, rather than trying to understand *expecting that p* by appealing to the idea of *believing that p is probable or likely*, I reverse the order of explanation and try to understand *believing that p is probable* by appealing to the idea of *believing that it is reasonable to expect that p*. In order to implement this order of explanation, the core of the paper attempts to show how expecting can be type-identified in terms of its functional role in our cognitive lives, without reference to a prior notion of probability. I argue that its functional role can be unpacked in terms of (a) the role that expecting plays in supplying grounds for, among other things, adopting a course of action and (b) the sorts of considerations that give rise to and render reasonable an expectation that *p*. In the penultimate section of the paper I show how this reading of probable can help us to make sense of how objective *numeric* probabilities can play a role in epistemic appraisal.

*Keywords:* epistemic probability, reasons and reasonableness, expecting, presuming, epistemic modals, relative frequency, Bayesianism, deliberation, Wilfrid Sellars, Stephen Toulmin

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[Note: Since this is only the current draft, and not the final version, of a paper that I hope will eventually appear in more permanent form, I request that readers not quote from this draft in anything that they publish.]

## 1. INTRODUCTION

This paper is an attempt to elaborate an account of what I believe to be the fundamental *epistemic* sense of probability. The particular account to be elaborated is guided by the following ideas:

- a) that Sellars (1964, p. 198) was right when he claimed that a certain non-metric sense of ‘probable’ is the fundamental or basic sense in relation to which other epistemically normative senses are to be understood and that to say it is probable that  $p$  is to say that it is reasonable to adopt a particular propositional attitude toward  $p$  (i.e., that there are good reasons for adopting that attitude toward  $p$ ).
- b) that Carnap (1962, §42, p. 182) was on the right track when he claimed that the word ‘probable’ and its counterparts in German, French and Latin

were used originally in everyday speech for something *that is not certain but may be expected to happen* or presumed to be the case. [Italics not in the original]

Whether or not the word *originally* bore that sense,<sup>1</sup> I am strongly inclined to think that what Carnap took to be the sense in which ‘probable’ was “originally used” is close to *one* of the senses which it commonly bears today

- c) that Toulmin (2003/1958, chapters 1 & 2) was right in taking ‘probably’ to be one of a set of modal terms – call them epistemic modals – with which we qualify the “force” of the conclusions we draw, and that Toulmin et al. (1984/1979, p. 87) were correct in supposing that the addition of such qualifiers

has the effect of indicating what *sort* of reliance the supporting material entitles us to place on the claim, C.<sup>2</sup>

- d) and finally that I was right when I maintained (Pinto 2006, p. 298) that each of these modal qualifiers is connected with a member of a *series* of cognitive or doxastic attitudes – presuming that  $p$ , expecting that  $p$  and believing without qualification that  $p$ , for example – each of which can be type-identified by reference to the *functional role in our cognitive lives* that it bestows on its propositional content.<sup>3</sup>

The present paper attempts to flesh out points (a) through (d) in more detail. It will try to show how a Touminesque account<sup>4</sup> of the force of ‘Probably’ can be unpacked in terms of a particular doxastic attitude – expecting that  $p$  will turn out to be the case<sup>5</sup> – and how that attitude can be type-identified by reference to its functional role in our cognitive lives.<sup>6</sup>

Of course, one way to understand the relevant sense of *expecting* is to take the notions of belief and probability for granted and to identify *expecting that  $p$*  with *believing that it is likely or probable that  $p$* . Such an approach leaves us with the problem of explaining what it is for a state of affairs to be

likely or probable. In this paper, I propose to reverse the order of explanation, as it were. I propose to illuminate what it is for something to be probable by appealing to a *prior* notion of expectation.

At the same time, I am a pluralist when it comes to the term ‘probable’, and recognize that in addition to its use in the epistemic sense which I attempt to unravel in this paper, it is also legitimately used by others to refer to at least two other quite different things:

- i) it is often used in a purely objective, aleatory sense in which (to use Hacking’s phrase – see note 1 above) it is essentially tied to the production of “stable relative frequencies”
- ii) it is sometimes used to refer to the degree of belief or degree of confidence which an individual has in a proposition.

The next-to-last section of the paper will briefly discuss the relationship between these senses and what I take to be *epistemic* (or epistemically normative) senses of the word probable.

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The account of ‘probable’ I am attempting to develop contains a strong echo of Sellars’ claim (1964, p. 198) that

[i]n the *basic non-metrical sense of “probable” (in relation to which all other senses are to be understood)*, to say of a statement or proposition that it is probable is, in first approximation, to say that it is worthy of credence, that it is acceptable in the sense of being worthy of acceptance; that is, to put it in a way that points to a finer grained analysis, it is to say that all things considered there is good reason to accept it.

except that (i) where Sellars speaks of *accepting* that  $p$  I will, following Carnap, speak of *expecting* that  $p$ <sup>7</sup> and (ii) I am prepared to concede that not *all* other senses of probable are to be understood in relation to what Sellars called its “basic non-metrical sense.”

In addition to my debt to Sellars, I want acknowledge my debt to Ennis’ recent work on ‘Probably’ and “Probable”, which I rely on to support two “morals” or conclusions

- (i) that the force or meaning of ‘probably’ is distinct from (and not reducible to) a “numeric” (or metric) conception of probability (Ennis 2007, especially pp. 149-154)
- (ii) that the meaning of ‘probable’ is to be understood in terms of commitments that we are *justified* in making (Ennis 2007a).<sup>8</sup>

However, Ennis wants to make a sharp distinction between the term ‘probable’, whose meaning he takes to involve a notion of epistemic justification, and the term ‘probably’, which he thinks does not involve a notion of epistemic justification. I, on the other hand, make no such distinction between these terms.

## 2. REASONS AND REASONING: PROPOSITIONAL ATTITUDES AND MODAL QUALIFIERS

### 2.1 REASONS AND REASONABLENESS

Philosophical discussions of reasons have tended to center around either reasons for action or reasons for belief. However, preoccupation with just these two sorts of reasons is, in my estimation, objectionably narrow, since belief is just one of a host of propositional attitudes which we can have reasons for adopting. In addition to reasons for believing, we can have reasons for adopting other cognitive or doxastic attitudes toward propositional contents: reasons for suspecting, reasons for

doubting, reasons for presuming, reasons for expecting, and so on. And in addition to reasons for holding these various sorts of *cognitive* attitude, there are reasons for adopting *conative* attitudes such as having it as a goal that such-and-such be the case or intending to pursue a particular course of action (perhaps in order to bring it about that such-and-such will be the case), as well as reasons for adopting certain “*evaluative*” attitudes such as prizing fairness or preferring being president to being right, which themselves play a crucial role (along with cognitive attitudes) in providing us with reasons for making this or that our goal or with reasons for intending to pursue one course of action rather than another. Pinto (2009, part 1) lays out the rationale for recognizing just this way of categorizing the sorts of things for which we can have reasons.

I have argued – in Pinto (2009, parts 2 and 3) – that the force of reasons is primarily a *normative* force. That is to say, although reasons *can* be among the causes for action or for adopting propositional attitudes of the sorts catalogued, more basic than their causal function is the role of “good” reasons in making it “OK” or “*reasonable*” for us to act in various ways or to adopt various propositional attitudes.<sup>9</sup>

When a person S *has a good reason* for doing something (e.g., believing a particular proposition) and there is no overriding or undermining consideration which “defeats” that reason, then it is tempting to say that S has a certain kind of *entitlement* (or, as some like to say, “justification”) to do it. For example, my knowing that one of Smith’s professors at University X reports that Smith received a BA from University X might be considered a good reason which, in the absence of “defeating” considerations, entitles me to believe that Smith has a BA.

However, it sometimes happens – for example if I am making a decision about whether to admit Smith to a graduate program – that, although I have a good undefeated reason for deciding to admit Smith, I ought not to make up my mind without obtaining further information (perhaps an official transcript or the results of formal enquiries made of several referees), and that therefore it is not reasonable for me to make a decision until that further information has been acquired. In light of this I want to say that it is *reasonable* at a time t for a person S to do a certain thing if at time t (i) S has a *good reason* for doing it, provided that (ii) S’s good reason is not defeated by undermining or overriding evidence in S’s possession and (iii) it is not the case that S ought to seek out or obtain additional information before doing it.<sup>10</sup>

Whatever else a good reason is, it is something the possession of which makes it *reasonable* for a person to “do” something – to act in a certain way, or to hold a particular attitude toward a specific propositional content – subject to the two provisos just formulated.

## 2.2 REASONING

*Reasoning* is the attempt to *ground* or *anchor* a propositional attitude A toward some propositional content in *reasons*. And I take that to mean: reasoning is the attempt to ground an attitude A toward a specific propositional content (e.g. that it is raining now) in one’s attitudes toward certain other propositional contents (e.g. that the street outside has just become wet), attitudes which under the right circumstances can *entitle* one to adopt attitude A toward that propositional content.<sup>11</sup> Reasoning always involves a “grounded attitude” and one or more “grounding attitudes” which are taken to provide reasons for adopting or holding the grounded attitude. And since I often *have* reasons which never come into play – which never move me to do what they entitle me to do – reasoning is a process in which reasons come to bear fruit by giving rise to or anchoring the doings they are reasons for

### 2.3 THE ROLE OF EPISTEMIC MODAL QUALIFIERS

In the simple and straightforward reasonings that logicians are typically trying to assess, unqualified acceptance of a “conclusion” is grounded in unqualified acceptance of certain other propositional contents called “premisses.” In those simple and straightforward cases, where both grounding and grounded attitudes are attitudes of unqualified acceptance, we can adequately represent what is going on in a piece of reasoning without bothering to classify or identify the attitudes involved – since in each case the type of attitude is the same. It is sufficient to list the propositional contents, and to indicate of each whether it is a premiss or a conclusion – i.e., whether it is functioning as the content of a *grounding* or of a *grounded* attitude.

But in less simple cases, classifying and keeping track of the *types* of grounding and grounded attitudes becomes necessary. As I see it, one of the uses of *epistemic modal qualifiers* like ‘certainly’, ‘probably’, ‘presumably’, ‘possibly’, etc., is to provide a way of representing the elements of reasoning in which cognitive attitudes other than unqualified belief or acceptance are in play. However, it is essential to realize that just as ‘It is desirable that *p*’ is a *normative* expression meaning something like “It is right (or it is reasonable) to desire that *p*”, the modal qualifiers I just mentioned also have a *normative* dimension. Just as ‘It is desirable that *p*’ implies *entitlement* to a certain *conative* attitude, so the modal qualifiers just mentioned imply *entitlement* to various *cognitive* attitudes.

The normative dimension of these modal qualifiers is explicit in Toulmin’s discussion of such qualifiers in Chapter 1 of *Uses of Argument* (Toulmin 2003/1958), where he distinguishes between their force (which he claims is context or “field” independent) and the criteria for their applications (which he claims are “field” or context dependent). In the following passage, he illustrates that distinction with the term modal term “possible.” In quoting the passage, I have italicized the phrases which make it clear that normative considerations are essential to the account of “possibility” he is offering:<sup>12</sup>

In order for a suggestion to be a 'possibility' in any context ..., it must 'have what it takes' in order to be *entitled to genuine consideration* in that context. To say, in any field, 'Such-and-such is a possible answer to our question', is to say that, bearing in mind the nature of the problem concerned, such-and-such an answer *deserves* to be considered. This much of the meaning of the term 'possible' is field-invariant. The criteria of possibility, on the other hand, are field-dependent, like the criteria of impossibility and goodness. The things we must point to in showing that something is possible will depend entirely on whether we are concerned with a problem in pure mathematics, a problem of team-selection, a problem in aesthetics, or what; and features which make something a possibility from one standpoint will be totally irrelevant from another. (p. 34)

The illustration is instructive both because it is plausible (given the examples supplied in the surrounding text) and because it indicates quite clearly how by virtue of its force a modal operator has “practical implications” for the role that its propositional content can properly play in our cognitive lives. Moreover, the implications are *practical* in the sense that they are action-guiding – what is *possible*, on this account, is what *deserves to be considered* in the context at hand. The practicality in question involves an *epistemically normative* consideration.

It is easy to see how parallel accounts can be given of other epistemic modals such as ‘necessarily’ and ‘certainly’ – that is to say, how the “practical implications” of their use can remain the same while the criteria for their application varies from context to context. Moreover, it is not difficult to see how those implications are readily construed as *epistemically normative* considerations. For the

propositions which are necessary, like those which are certain, are propositions whose negations are *not*, for one or another kind of reason, *entitled* to genuine consideration.<sup>13</sup>

### 3. THE FORCE OF ‘PROBABLY *P*’ – REASONABLE EXPECTATION

Toulmin offers his account of the modals ‘probable’ and ‘probably’ in chapter 2 of *Uses of Argument*. It is important to see that in this chapter the force of ‘probable’ and ‘probably’ is unmistakably connected with *epistemically normative* considerations.<sup>14</sup> Thus Toulmin says (pp. 76-77) that

...statements about the probability of *p* are concerned, in practice, with the extent to which we are *entitled* to bank on, take it that, subscribe to, put our weight and our shirts on *p*... [Italics added]<sup>15</sup>

A few pages later (pp. 83-84) he says that:

[b]y qualifying our conclusions and assertions in the ways we do, we *authorize* our hearers to put more or less faith in the assertions or conclusions, to bank on them, rely on them, treat them as correspondingly more or less trustworthy. [Italics added]

and that (p. 84)

[t]he numerical discussion of probabilities becomes, no doubt, sophisticated and somewhat complex, but unless a calculus provides a means of estimating how far propositions are *entitled* to trust or belief, it can hardly be called a ‘calculus of probabilities’ at all. The development of the mathematical theory of probability accordingly leaves the *force* of probability statements unchanged; its value is that it greatly refines the *standards* to be appealed to, and so the morals we can draw about the degree of *expectability* of future events. [Italics have been added to ‘entitled’ and to ‘expectability’]<sup>16</sup>

These latter two passages echo the observation quoted above (from Toulmin *et al.* 1984/1979, p. 87) that the addition of such modal qualifiers “has the effect of indicating what *sort* of reliance the supporting material *entitles* us to place on the claim, *C*” [italics added to the word ‘entitles’].

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Moore has pointed out that there is something wrong or inconsistent – usually understood to amount to a pragmatic inconsistency – in saying

1) It’s raining but I don’t believe that it’s raining

But, there is not, as far as I can see, any clear-cut inconsistency, pragmatic or otherwise, in saying

2) It will probably rain tomorrow, but don’t believe (i.e., am not convinced) it will.

We can, I think, use those words to convey the idea that we are not ready to bank or *count on* rain tomorrow, even though we concede rain to be probable. It seems to me, however, that there is clearly something incoherent about saying:

3) It is probable that it will rain tomorrow but I don’t expect that that it will.<sup>17</sup>

The problem with (3) is, I think, a pragmatic inconsistency due to the fact that it is not *reasonable* to refuse to expect what you concede is probable. But why not?

My suggestion is this:

Saying “it is probable that  $p$ ” is equivalent to saying “it is reasonable to expect that  $p$ .”

That equivalence (which I am suggesting obtains) is quite different from the following equivalence, which quite clearly does *not* obtain:

Saying “it is probable that  $p$ ” is equivalent to saying “it is reasonable believe (i.e., to be convinced) that  $p$ .”

What I am suggesting is indeed a variant of the Sellarsian idea quoted in section 1 above, and might be expressed as follows:

In a basic *epistemic*, non-metric sense of “probable” (in relation to which all other *epistemic* senses are to be understood), to say of a statement or proposition that it is probable is, in first approximation, to say that it is worthy of some kind of *qualified* acceptance; that is, to put it in a way that points to a finer grained analysis, it is to say that all things considered there is good reason to *expect* it to be true.

#### 4. “QUALIFIED” BELIEF AND/OR ACCEPTANCE

To make sense of *expecting*, in terms of which I want to unpack the idea of probability, we need to make sense of *qualified* belief and/or acceptance. And like Adler (2002, p.232) I want to make a sharp, *qualitative* distinction between full or unqualified belief and the states of “partial belief” which (in Adler’s words)

are most naturally presented with such qualifications as “pretty sure,” “very sure,” “more sure than not,” as well as “think,” “suspect,” or “inclined to believe” – paradigmatically, “I am pretty sure that  $p$ .”<sup>18</sup>

With L.J Cohen (1992) and Michael Bratman (1999, chapter 2),<sup>19</sup> I distinguish between the propositional attitudes of belief and acceptance. I have discussed this distinction at some length on a prior occasion (Pinto 2003b/2009). Accepting a proposition is a matter of *being prepared to use it as a premiss*, and is context dependent. Normally, we use as premisses what we believe to be true, but there can be contexts in which it is reasonable for us to accept propositions which we don’t believe<sup>20</sup> – and even contexts in which it will be reasonable for us to accept something that is contrary to what we actually believe (as when we reason from simplifying assumptions which we know to be false – see Pinto 2003b/2009). And there will be contexts in which it will be reasonable to refrain from accepting a proposition which we actually believe<sup>21</sup> (as when – to use Bratman’s phrase – we “bracket” a proposition which it would be inappropriate to rely on in that context – see also Pinto 2003b/2009). Acceptance therefore turns out to be context dependent, whereas belief is not context dependent (see Pinto 2003b/2009 and Bratman 1999 on this point).

Let explain my current understanding of how belief and acceptance are related to each other, with an eye to fine-tuning these concepts to accommodate the distinction between “full” and “partial” belief and acceptance. I first introduce the notion of *relying on a proposition in my reasoning*:

I *rely* on the proposition that  $p$  at  $t$  if and only if I employ that proposition as a premiss in an inference I make at  $t$  (i.e., it is the propositional content of a “grounding” propositional attitude in the reasoning in which I’m engaged at  $t$ )

*Accepting* a proposition is a matter of being *prepared* (willing) to *rely* on it. The propositions that I accept in a certain context are the propositions that are *available* for me to use as premisses in that context.

I *accept* that *p* at time *t* if and only if I am willing or prepared at *t* to rely on *p* in the reasoning in which I am engaged at *t*.

Believing that *p* involves more than just accepting it, in the sense just defined. I offer the following, not as a definition of believing, but as a true statement about the relationship between believing a proposition and being prepared to accept it:

I *believe* that *p* at *t* if and only if at *t* I am prepared or disposed to rely on *p* in my reasoning at *t* and at any future time *t'*, provided that there is no special reason at those times for refraining from such reliance.

Thus even if I believe that *p*, I may not *accept* that *p* at some given time *t*, should I think I have at *t* some special reason for not relying on *p* at *t*. And even if I accept that *p* at *t*, I may or may not *believe* that *p* – for I may not be prepared to accept that *p* in my reasoning at any future time at which the proviso just mentioned fails to apply. In Bratman's phrase (1999, p. 29), my beliefs make up the "default cognitive background" in terms of which I do my reasoning, but the disposition to accept the propositional contents of any one of my beliefs can be overridden in a particular context if there is a special reason not to rely on its propositional content in that context.

Accordingly, we can make sense of the fact that I can have reasons which *warrant accepting* a proposition on a particular occasion which do not *warrant believing* that proposition. A reason which warrants *believing* that *p* warrants relying on *p* at any future time at which there is no special reason for not relying on it. But a reason which warrants *relying on p right now* may involve factors that hold right now but cannot reasonably be assumed to hold at most future times when I might have occasion to rely on *p*.<sup>22</sup>

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We can fine-tune these concepts a bit further by introducing distinctions between *unqualified* and *qualified* reliance on a proposition and between *unqualified* and *qualified* acceptance.

I *rely without qualification on the proposition that p* at *t* if and only if (a) I employ that proposition as a premiss in an inference I make at *t* and (b) I do so in a manner in which *I do not count the proposition that not-p as a real or genuine possibility*.<sup>23</sup>

I *accept that p without qualification* at time *t* if and only if I am prepared at *t* to *rely without qualification on p* in the reasoning in which I am engaged at *t*.

Unqualified belief – what some have called *full* (as opposed to partial) belief, what Bratman called *flat-out* belief and what I would call being convinced that *p* – is a matter of being prepared to accept a proposition *without qualification* both now and at any future time, provided that there is at those times no special reason for not accepting it without qualification. *Expecting* that *p*, or *suspecting* that *p*, do *not* involve unqualified belief or acceptance that *p* – and the reason is that these latter two propositional attitudes both involve explicit recognition that it is genuinely possible that not-*p*.

There are, it seems to me, two crucial differences between unqualified belief or acceptance and qualified belief or acceptance.



- a) Unqualified belief or acceptance that *p* requires *discounting* the possibility that not-*p*, whereas qualified belief or acceptance involves *acknowledging* that there is a real or genuine possibility that not-*p*.<sup>24</sup>
- b) Adjunction (or what Bratman [1999, p. 19] calls *agglomeration*) applies to unqualified belief and acceptance, but does not apply to qualified belief or acceptance. That is to say, if it is reasonable to believe/accept that *p* and it is reasonable to believe/accept that *q*, then it is reasonable to believe/accept that *p* & *q*. But from the fact that it is reasonable to *expect* that *p* and it is reasonable to *expect* that *q*, it does *not* follow that it is reasonable to expect that *p* & *q*. Otherwise, whenever it were reasonable to expect of each individual ticket in a lottery that it will lose, it would be reasonable to expect that no ticket will win.

I suspect, by the way, that point (b) is a consequence of point (a), but I do not know how to prove that this is so.

Please note that the contrast I am trying to capture should *not* be reduced to the idea that unqualified belief or acceptance that *p* is a matter of according a numeric probability of 1 to the proposition that *p* (and therefore assigning a numeric probability of 0 to the proposition that not-*p*).<sup>25</sup> For declining to treat the falsity of *p* as something that deserves to be taken into account as a possibility need *not* be the same as assigning a probability of 0 to the proposition that not-*p*. For example, a reasonable policy is to assign a probability of 0 only to those propositions which are “logically impossible,” or only to those propositions which semantically entail propositions which are logically impossible. But it is, as far as I can see, logically possible that I am a brain in a vat, but by my lights that is not a possibility that deserves serious consideration in most contexts.<sup>26</sup> And this attitude of mine is part of why it is correct to say of me that I believe without qualification that I am not a brain in a vat.

## 5. EXPECTING THAT *P*

What we *expect*, but do not unqualifiedly accept or believe, can function as a *reason* in contexts of deliberation. Thus if I want to meet Saul this afternoon and I expect that if I go to the library this afternoon I will meet him there, then I have a (non-conclusive) reason to go to the library this afternoon.

Of course, what we count as “genuinely possible”, but do *not* expect, can *also* function as a reason in contexts of deliberation. Thus consider the issue of what to make of the possibility that a nuclear accident like the one which occurred in Chernobyl will occur at a nuclear plant in the US or Canada. I personally don’t see how estimates of the numeric “objective” probability of such accidents can be very solidly based – but there still is an unavoidable issue of whether to count the *possibility* of such accidents as a “serious” possibility, that is to say, as something to be taken into account in our deliberations. If we do count it as a serious possibility, then even if we don’t *expect* such a thing to occur, its mere *possibility* will count as a *reason* (though perhaps not a conclusive reason) for refusing to build any more such plants or for not permitting the continued operation of existing plants. Moreover, the force of reasons arising from the fact that we *treat it as genuinely possible that p* is different from the force of reasons arising from that fact that we *expect that p*. Thus if it were reasonable to *expect* such accidents will occur, then (depending of course on our conative and/or evaluative attitudes) we would surely have a *conclusive* reason for not permitting the continued operation of existing plants, let alone for not building new ones.

Thus *expecting that p* and *treating it as genuinely possible that p* are qualitatively distinct cognitive attitudes both of which can function as grounding attitudes in our reasoning – certainly in our practical reasoning and perhaps in our theoretical reasoning as well as. It is clear that, against the background of conative and/or evaluative attitudes, they can supply considerations that play premiss-like roles in the inferences that occur in the context of deliberation. Bratman (1987, pp. 36-37) once treated the cognitive component of deliberation as consisting only of “flat-out” or unqualified beliefs. Later (1999, chapter 2) he acknowledged and stressed the importance of context-relative acceptance (or “taking for granted”) as a crucial component of the “cognitive background” of deliberation. I am maintaining that in addition to the sorts of unqualified belief and acceptance Bratman recognized, we need to explore the roles in deliberation of expecting that *p* and taking seriously the possibility that *p*.

I submit that these cognitive attitudes are to be distinguished by

- (a) *what they can supply reasons for* (that in relationship to these attitudes are *inputs*),
- (b) the *circumstances* under which they can play the role of reasons, and
- (c) *what gives rise to* and/or what renders them reasonable (that in relationship to these attitudes are *reasonable outputs*)

For example, I think a distinction ought to be made between *presuming that p* and *expecting that p* (and a corresponding distinction between what is probably so and what is presumptively so<sup>27</sup>). Both *presuming* and *expecting* can be treated as species of qualified acceptance. But, if we follow Ullman-Margalit or Kauffeld in our understanding of presumption, what marks something as a presumption is the fact that it arises from and is justified by very distinctive sorts of consideration. In Ullman-Margalit (1983, p. 162), “the presumption rules” which “sanction the passage from P to Q” may be “motivated, to a greater or lesser degree, by the canons of governing inductive reasoning, but not exclusively by them.” Presumption rules “must be motivated also by certain evaluative considerations which are primarily concerned with the differential acceptability of the relevant sorts of expected errors: the fact that one sort of error is judged to be, in the long run and all things considered, preferred on ground of moral values or social goals to the alternative sort(s) constitutes an overriding reason for the decision underlying the presumption rule.” See also p. 157 where, in addition to inductive-probabilistic considerations and value-related considerations, procedural considerations can also be among the considerations that justify a presumption rule (compare also pp. 161-162 on this point). Moreover, in Ullman-Margalit’s account, the circumstances under which presumptions can play a role are explicitly limited to contexts of deliberation.

Kauffeld (2003) gives an account in which presumptions are inferences arrived at on a different, but still very distinctive, sort of ground – what he calls the “risk of resentment.” In a recent restatement of this idea (Kauffeld 2009) he writes

To presume that *p*, in the ordinary sense of the term, is *to infer that p on the supposition* some agent has made, is making, or will make it the case that *p*, rather than risk criticism, retribution, etc. for failing to do so. Such inferences are founded on the commitments persons undertake, often openly and explicitly, and on the (corresponding) entitlements due others. [Italics added]

In what follows, I concentrate on the role of expectation in *deliberation* – in part because it is easier to see the differences between expecting, believing and taking for granted in the context of deliberation. But of course deliberation – conscious and explicit reasoning about what to do – is just one important context in which expectations can play a crucial role. Thus in our day to day interactions with others, we are able to co-ordinate our interactions with them successfully and more or less spontaneously

because we are able to form and act on the basis of reasonable expectations concerning what they will do and how they will react to our behavior toward them.<sup>28</sup>

## 6. THE ROLE OF THE *POSSIBLE* AND THE *PROBABLE* IN DELIBERATION

There are of course models of decision-making in which the assignment of *numeric* probabilities plays a central role. Crudely put, in most such models one chooses among courses of action on the basis of expected utilities, and one determines the expected utility of each course of action by listing its possible outcomes and then adding up the products of the numeric probabilities and numeric utilities of those outcomes.<sup>29</sup> Clearly there are decision problems for which such methods are appropriate and useful. However, Bayesianism notwithstanding, those methods are appropriate only in situations where there is an *evidentiary* basis for assigning numeric probabilities to outcomes and where a principled approach to assigning cardinal numbers to the utility of outcomes is available. Very frequently, perhaps even in the majority of cases in which we make decisions under conditions of *uncertainty*, those enabling conditions don't apply. In that event, we must fall back on *qualitative* probability judgments – that is to say, we must fall back on judgments about what it is reasonable to expect.

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Let me begin with some general remarks about practical reasoning carried out on something other than on an “expected utility” model. Following Bratman (1987, chapter 2, especially section 2.2), I distinguish between desires and intentions and I agree with him that an adequate understanding of practical reasoning is impossible without recognizing that intentions play a crucial role over and above the role of desires. An intention (p. 16) “involves a special commitment to action that ordinary desires do not.”<sup>30</sup> Intentions (p. 27) are “conduct-controlling pro-attitudes, they have inertia,<sup>31</sup> and they serve as inputs to further practical reasoning.” Intentions serve as inputs to further practical reasoning because the fact that I intend to do A can give me a *reason* for doing B in order to carry out A, and can give me a reason for *not* doing C where doing C is not consistent with doing A.<sup>32</sup>

Suppose that in light of my desires and preferences, I form an intention to perform a certain action in the future – for instance, I decide to attend medical school next year. It seems to me a minimal condition on the rationality of such a choice that (a) I treat what I decide to do as something that it is genuinely possible for me to do and that (b) it is *reasonable* for me to treat it as something that is genuinely possible for me to do. These conditions will be satisfied if, for example, I've received an acceptance letter from a med school and I have reason to think I have at least a chance of raising the money I'll need for tuition and expenses. Moreover, I submit that these are constraints on whether a conceivable course of action is an option worth considering:

P1 I have a (non-conclusive) reason for considering a conceivable course of action an option worth considering *only if* I am prepared to treat that course of action as one that it is “genuinely possible” for me to perform

And, of course, my reason will be a *good* reason only if it is reasonable for me to do so.

Moreover, a conceivable course of action is worth considering in a context of deliberation only if it has some bearing on what I desire, prefer or intend to do. Hence I submit that we recognize a second sort of constraint on options worth considering:

P2 I have a (non-conclusive) reason for considering a conceivable course of action A an option worth considering *only if* I treat it as “genuinely possible” that performing A will produce some *specific* outcome I desire or prefer, or will make it possible for me to perform some other

*specific* action that I intend to perform – in short, only if I treat it as “genuinely possible” that performing A will result in some *specific* benefit.

Again, my reason will be a *good* reason only if it is *reasonable* for me to treat it as “genuinely possible” that this course of action will have such a result.

But of course it is one thing to treat a conceivable course of action as an option, it quite another to settle on that course of action – to form an intention to perform it. Is it a necessary condition of settling on a course of action that, in addition to considering it genuinely possible that it will have certain results, I know or at least *expect* that it will? Surely sometimes we perform actions which we don't expect will produce the results we are *hoping* for, and sometimes it will be rational or reasonable for us to do so – “nothing ventured, nothing gained” we often say in such cases. Consider buying a lottery ticket as an example. If I am rational, I expect that the ticket I buy will *not* win. Why then buy it? For many of us the answer to that question may well be: to have a *chance* of winning.<sup>33</sup> But such a consideration can function as a reason if and only if I assume or expect a *chance* of winning is a benefit that would result from buying the ticket. If I learn that the lottery is fixed (and that I therefore have *no chance* of winning) or if I don't really care whether I have a chance of winning, then “having a chance of winning” can't function as a reason for opting to buy the ticket.<sup>34</sup> Hence I propose a third principle:

P3 I have a (non-conclusive) reason for settling on a conceivable course of action *if and only if* I *assume* or *expect* that performing that course of action will result in some *specific* benefit.

Let X be the benefit I have in mind. Then my reason for settling on a course of action A will be a *good* (non-conclusive) reason if and only if (a) it is *reasonable* for me to assume or expect that performing action A will result in X and (b) it is *reasonable* for me to treat X as a benefit.<sup>35</sup>

The reader can perhaps see where I am going with this. I am suggesting that a defining function of *expecting* as a *cognitive* attitude is that it can, *in the absence of certainty* and in conjunction with the *evaluative* attitude of *treating something as a benefit*, render its *propositional content* a (*prima facie*) *reason for settling on a course of action*.

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But even though the belief-like attitudes which *underpin* my deliberation are attitudes of “qualified” belief, it does not follow from that fact alone that in my actual deliberating I am forced to draw on those “qualified” attitudes in the course of my reasoning.

In many cases I can simply “assume” or, in Bratman's phrase, *take for granted* that what I expect to be the case will turn out to be the case. That is to say, for purposes of simplifying my deliberations at a particular point in time, even though I only expect that *p* and am not certain that *p*, I can decide to accept that *p* (without qualification, as it were) in the context of these particular deliberations. That, it seems to me, is often an eminently reasonable “deliberation strategy.” Consider the example Bratman (1999, pp. 22-23) uses to illustrate how context-relative acceptance or taking for granted promotes simplification of our reasoning (“taking it for granted that it won't rain even though I am not certain of this”) – it is clearly a case of simplifying by taking for granted what I only *expect* to be the case.<sup>36</sup>

One of the reasons why doing this often makes sense is that I can commit myself *now* to a certain course of action based on assumptions about what will happen in the future, but scuttle that plan if the assumptions on which it's based don't pan out. I can always revise my plans. Today I plan a picnic for us tomorrow, assuming fair weather and fleshing out the plan with all the steps I need to take in order for us to have a picnic tomorrow. But if tomorrow morning it is raining or threatening to rain, I can

simply scuttle the plans I've made today and replace them tomorrow with very different plans for how to spend the day.

In many circumstances, however, intelligent planning for the future will require that I don't take for granted some or all of the things I merely expect. This will be the case whenever it is important to have a "backup plan" ready in the event my expectations are disappointed. Thus, instead of taking for granted that it won't rain, I can instead fashion a plan which contains conditional "sub-plans" which before elaboration might look like this:

- a) If the weather tomorrow is sunny and warm, we will have a picnic (Plan A)
- b) If the weather tomorrow is *not* sunny and warm, we will go to the theater (Plan B).

Let's call Plan A and Plan B *branches* of my overall plan. In formulating a *branching plan*, we often (though not always) must take into account what we actually *expect* to happen. Here is why.

The branches of such plans for what to do in the *future* may, when elaborated, involve steps which we must take *now* – I will call them *preparatory steps*. For example, perhaps we can't have a picnic *tomorrow* unless we buy and prepare food, blankets, etc., for the picnic *today*. Or perhaps we can't go to the theater *tomorrow* unless we purchase tickets *today*. Moreover, adopting a branching plan commits us to taking the preparatory steps for all its branches – since if its preparatory steps are not taken, the branch will be null and void. Therefore, where a branch requires preparatory steps that must be taken immediately, *any costs associated with those steps are costs which we incur by including that branch in our plan* – they become costs of adopting the plan as a whole. (And, of course, any benefits that flow from those steps are benefits that flow from the plan as a whole.)

Now the preparatory steps in an elaborated "conditional plan" may or may not involve costs which are (in our view) more than negligible.

When the costs incurred by a branch are negligible, it does not matter whether we *expect* the preparatory steps required by that branch to produce specific benefits, so expectations concerning that branch need not become a factor in our planning. Notice however that even when costs are negligible it *does* matter whether we are prepared to treat the triggering condition as a "genuine possibility" For a corollary of P1 is

- P1a We have a (non-conclusive reason) for including a possible branch in our plan *only if* we are prepared to treat its triggering condition as "genuinely possible."

The idea here is that we ought not to clutter our plan with branches which we think don't have any real chance of "kicking in." This has the important consequence that in the example above we would not have a reason for including Plan B in our overall plan if we had "taken it for granted" or *assumed* that it will be fair and sunny.

But now suppose we judge the costs associated with the preparatory steps of one or more branches to be more than negligible. Surely we can have a reason for including such a branch in our plan if we *expect* its triggering condition will occur and therefore expect that executing the branch will produce a specific benefit. For example, it usually makes sense to incur the expenses of preparing for a picnic tomorrow if we *expect* that the weather will be fair and sunny and we expect to enjoy the picnic. Thus it is tempting to say

- P3a If we judge the costs associated with the preparatory steps of a conceivable branch to be more than negligible, we have a (non-conclusive reason) for including that branch in our plan *if and only if* either (i) we *expect* that its triggering condition will occur and that the branch will

produce specific benefits or (ii) we believe or *expect* we will obtain a benefit from its preparatory steps even if its triggering condition does not occur.<sup>37</sup>

But can it make sense, in light of P3a, to purchase theater tickets with an eye to Plan B if we don't *expect* that Plan B will actually go into effect? It seems to me that it is often reasonable to consume resources in order to preserve an *opportunity* if events don't turn out as we expect them to – i.e., if the costs associated with certain steps are viewed as *opportunity costs*. That is so say, even if Plan B does not actually go into effect, the *opportunity* to put it into effect should its triggering condition occur may be deemed a *benefit* which, under clause (ii) of P3a, may warrant its inclusion in the plan. (And of course in some but not all cases, the costs incurred by including Plan B might promise *other* benefits as well – e.g. I might offer the tickets to a neighbor if we don't use them, thereby helping to reduce some tension that exists between me and that neighbor). In light of this, I want to maintain that in general it is *reasonable* to include a branch requiring preparatory steps in a plan if and only if (a) the costs incurred by its preparatory steps are negligible or (b) we expect *some* benefit to flow from its preparatory steps whether or not the triggering conditions of that branch actually occur.

In light of these considerations, I submit that we can endorse P3a, which I take to be a corollary of P3. In short, where we require a branching plan whose preparatory steps incur non-negligible costs, we can no longer employ the simplifying strategy described above – we can no longer simply take *for granted* or *assume* what we only *expect* to be the case. Here we see quite clearly the function of *expecting* as a *cognitive attitude* which, *in the absence of certainty* and in conjunction with the *evaluative* attitude of *treating something as a benefit*, can *render its propositional content a reason for settling on a course of action*.

## 7. PROBABILITY AND RELATIVE FREQUENCY

I said above in section 5 that there is a third factor by which cognitive attitudes are to be distinguished from each other, namely

- (c) what *gives rise to* them (and in particular that in relationship to these attitudes are *reasonable outputs*)

A thorough treatment of *expecting* that *p* would therefore include a full account of what gives rise to *reasonable* expectations – of what renders expectations reasonable. A full account of the grounds which can render expectations reasonable is beyond the scope of this paper. However, a few remarks about this matter are in order.

Central to the sort of considerations that give rise to and render reasonable both *expecting that an event of a certain kind will occur*, as well as *taking its occurrence to be a genuine possibility*, are estimates of the *relative frequency* with which events of that *sort* are “known” or believed have occurred in the past.<sup>38</sup> Such estimates of relative frequency can be either *numeric* or *non-numeric*. Non-numeric estimates of relative frequency are conveyed by such expressions as ‘X’s are usually Y’s’, ‘X’s happen all the time’, ‘X’s are pretty rare’, ‘most of the people of such-and-such a description are like this’, ‘no need worry about X, since it almost never happens’, and so on.

It must be kept in mind that when numeric or non-numeric considerations of relative frequency play a role in rendering our expectations reasonable, those considerations are *not by themselves sufficient* to render those expectations reasonable.<sup>39</sup> Goodman’s “new riddle of induction” – the blue/green paradox – makes it clear that not every sort of projection, prediction or extrapolation based on past frequencies is a good one, and that ancillary considerations must come into play (see my discussion of

Goodman's riddle in Pinto 2001, chapter 9, especially section 3 but also section 4). The fact that considerations of past or "known" relative frequency are not by themselves *sufficient* to render expectations reasonable gives rise to much of the difficulty in getting clear about the nature of so-called "inductive inference."

Moreover, it certainly appears to be the case that explicit considerations of relative frequency are not the *only* sorts of things that gives rise to expectations and may render them reasonable. Thus

- a) the proximal ground for an expectation may lie in considerations of *analogy* and *similarity* – for example, I expect John to be familiar with French history because I know that John and Bill are good friends who went through school together and that Bill is familiar with French history
- b) the proximal ground for many – perhaps most – of my expectations about the behavior of other specific individuals in my day to day interactions with them depends (to use Jean Goodwin's words) "on my reconstructing *reasons for action* from their perspective."

I call considerations such as these *proximal grounds* for expectations, because I suspect that lurking in the background of reasoning which employs them is either (i) the conviction that *much of the time* people do what they think they have reasons for doing or (ii) the conviction that objects or persons who are alike in certain specific respects are *usually* alike in certain other specific respects.

## 8. NUMERIC OR METRIC CONCEPTS OF *EPISTEMIC* PROBABILITY

In assessing the epistemic status of a claim we sometimes invoke "quantitative" or numeric probabilities. I've noted that Sellars (1964) maintains that there is a "basic non-metrical sense of 'probable' in relation to which all other senses are to be understood." So far I have only attempted to explicate one such "non-metric" sense of epistemic probability. I owe the reader at least a rough indication of how quantitative or numeric senses of probability that are invoked in the course of epistemic appraisal can be understood in relation to what I take to be its basic, non-metric epistemic sense.

Let me begin by distinguishing between

- (a) *objective* probability<sup>40</sup> in the sense of *chance*, a concept related to what in section 1 I called a more purely *aleatory* sense of probability that is essentially tied to the production of "stable relative frequencies," and
- (b) *subjective* probability, in which the numeric probability associated with something can be taken to indicate the *degree of confidence* a person does (or more recently in some accounts *should*) place in that thing.

The probability of a *kind* of event, in the sense of the *chance* that an event of that kind will occur, is intimately *connected* with (but not necessarily *identical* with) its relative frequency in an extended series of events. As a first approximation, saying that the probability or chance that a particular coin will come up heads when tossed is .5 *commits us* to saying that over a long sequence of throws of that coin the proportion of heads will *usually* be close to 50 percent. Of course, where the full apparatus of the probability calculus is at our disposal, and we are talking about an arrangement which has what Hacking called a "tendency ... to produce stable relative frequencies," we can formulate and defend a (weak or strong) law of large numbers which states in mathematically precise terms the *probability* that in a given number of trials  $n$ , the actual or observed relative frequency of heads will fall within the interval .5 plus or minus some given small interval  $\epsilon$ . A consequence of that law is that as  $n$  approaches

infinity that probability approaches 1. I am inclined to think that the attempt by early frequentists to *equate* probability with the “limit of a frequency”<sup>41</sup> is fatally flawed; I am attracted rather to accounts of objective probability which identify it with an objective tendency in certain “arrangements” which is not *identical with* any frequency, but which can *explain* why the “outputs” of those arrangements exhibit stable frequencies and do so in certain patterns.

But however one unpacks an “objectivist” account of probability in the sense of chance – either defining probabilities in terms of frequencies or identifying them with tendencies that give rise to and can explain objectively measurable frequencies, probability in an objective sense does *not* require that there be knowledge or belief (reasonable or otherwise) about those tendencies or frequencies. And therefore objective probability is not by itself an *epistemic* concept at all.

## 8.1 OBJECTIVE CHANCE AND *EPISTEMIC* PROBABILITY

It is clear, I think, that “objective” probability or chance can play a *role* in epistemic appraisal.

### 8.1.1 *Peirce*

One approach might be to treat a certain species of chance as central to logical or epistemic appraisal – namely, the *chance* that a conclusion arrived at by a particular method or a particular type of inference will be “correct” or close to correct. Peirce, for example, who appears to have held a dispositional or tendency account of probability in general (see Hacking 1990, p. 208), held that

[a] piece of evidence which yields likelihood always yields that likelihood by a process which would more often yield truth than the reverse; and every process which is known to give truth more often than the reverse gives likelihood. [Quoted by Hacking (1990, pp. 208-209), from Peirce (1982-, vol.1, p. 400).]

Citing Peirce (1982-, vol. 2, p. 294), Hacking attributes to him the claim that

If [the genus to which an argument belongs] is such that the conclusion is usually true when the premises are true, it [the argument] is merely *probable*.

Hacking (p. 209) comments,

When the premises are quantitative, we may be able to replace ‘usually’ by a numeric probability. That does not mean that the conclusion has a probability of such and such. Rather: the conclusion is reached by an argument that, with such and such a probability, gives true conclusions from true premises.

### 8.1.2 *Some uses of the concept of probability in 20<sup>th</sup> century “frequentist” statistics*

In introducing the ideas sketched in the preceding subsection, Hacking says (p. 206),

Peirce’s own theory of probable inference is closest to that of Jerzy Neyman and E.S. Peason [who, along with R. A. Fisher, were among the giants of the first half of the 20<sup>th</sup> century in the development of frequentist approaches to the probabilities employed in statistics]. That is, it is a theory of inductive behavior or doing.<sup>42</sup>

Let me illustrate 20<sup>th</sup> century uses of the role that objective numeric probabilities can play in epistemic appraisal with three examples – the first two of these exhibit the sort of “inductive behavior” that Neyman was referring to.

*Example 1:* Consider first how *projections from sample to population* are standardly dealt with in terms of probabilities and confidence intervals (using the apparatus in whose development Neyman apparently played a part). Typically, we are told that the relative frequency of a



property Q in a sample S drawn from a population P will fall within a confidence interval of plus or minus  $\epsilon$  of the relative frequency of Q in population P with a probability of 0.95.<sup>43</sup> The *epistemic* significance of such a statement becomes apparent if we take it to mean that, given certain assumptions about how the sample S was drawn, *it is reasonable to expect* that “over the long run” 19 times out of 20 the relative frequency of Q in samples drawn as S was drawn will fall within plus or minus  $\epsilon$  of the relative frequency of Q in P.<sup>44</sup> Such a “reasonable expectation” can prompt us to *decide to assume* that the relative frequency of Q in the sample is within  $\epsilon$  of the relative frequency of Q in the population P. The point I want to emphasize is that on such a reading, the notion of *probability* invoked can be taken to have explicit epistemic significance if we equate it with the “non-metric” sense of epistemic probability, here applied to the relative frequency with which samples drawn in a certain way can *reasonably be expected* to reflect the relative frequency of Q in the population.<sup>45</sup>

*Example 2:* Consider the use of numeric probability in determining whether or not a statistic which describes the data obtained in an experiment is “statistically significant.” Application of the concept of statistical significance involves computing the probability of obtaining the data obtained in a given experiment on the assumption that a “null hypothesis” is true. Using the phrasing in Hacking’s 2001 textbook (p. 215) – which reflects standard accounts of how the concept of statistical significance is employed – the upshot of a significance test is typically described as follows:

If a designated null hypothesis is true, then, using a certain statistic that summarizes data from an experiment like ours, the probability of obtaining the data we obtained, or less probable data, is 0.01.

Here again we can explicitly relate such measures of statistical significance to the concept of epistemic probability developed in this paper if we take Hacking’s phrasing to mean:

*It is reasonable to expect that*, if the null hypothesis is true, then with respect to a certain statistic that summarizes data from an experiment like ours, we will “over the long run” obtain data “like” those we obtained<sup>46</sup> no more than 1 percent of the time.

On the basis of such a reasonable expectation, we can *decide to reject* the null hypothesis. That is to say, we can see ourselves as invoking the “non-metric” sense of epistemic probability, here applied to the relative frequency of obtaining data of a certain sort on the assumption that the null hypothesis is true,<sup>47</sup> as guiding a decision to reject the null hypothesis.

In the two sorts of examples just described, estimations of the numeric probability of empirical outcomes of certain kinds are made possible by mathematical reasoning about idealized models and are applicable to empirical outcomes insofar as our experimental designs incorporate attempts to approximate certain features of those models (in particular, attempts to employ samples which come close to being random samples and/or samples in which we have “randomly” assigned the subjects in an experiment to different treatment groups). I leave it as an open question whether and when it can be *reasonable*, in the *absence* of such experimental designs, to form expectations concerning the frequency – for example, whether and when “induction by enumeration” can make it reasonable *in the absence of such experimental designs* to estimate of the frequency of instances of Q in a population P.

*Example 3.* Still another sort of example in which the concept of chance may be used in the course of epistemic appraisal can be found in certain straightforward applications of Bayes’ theorem – applications that do *not* require reliance on the sort of *subjective* “prior probabilities” invoked by “Bayesian” or subjectivist approaches to probability and statistics.

Bayes' theorem in its simplest form (call it version 1) says,

$$P(h/e) = \frac{P(h) \times P(e/h)}{P(e)}$$

In a slightly expanded form (call it version 2), the denominator on the right hand side is replaced by

$$P(e/h) \times P(h) + P(e/\neg h) \times P(\neg h).^{48}$$

If in applying Bayes' theorem, we take  $e$  and  $h$ , (or, if we are using version 3 described in note 48,  $e$  and the  $H_i$ ) to be *properties* or *kinds of event*, the “probabilities” in the equation can be construed as estimates of relative frequency.<sup>49</sup> Thus ‘ $P(h)$ ’ might be an estimate of the “base rate” frequency of a disease  $D$  in a population on interest, ‘ $P(e/h)$ ’ an estimate the relative frequency with which members of that population who have that disease will exhibit a positive result if given a certain diagnostic test  $T$ , and  $P(e/\neg h)$  an estimate of the relative frequency with which members of the population who do *not* have the disease will exhibit a positive result if given test  $T$ . On the basis of such estimates, version 2 of Bayes' theorem enables us to calculate the relative frequency with which members of that population who exhibit positive result of test  $T$  in fact suffer from disease  $D$ .

The conclusion drawn about the relative frequency of disease  $D$  among those who test positive will be *reasonable* only if the frequency estimates on the right side of the equation are reasonable. Accordingly, the numeric probabilities in any application of Bayes' theorem yielding a reasonable conclusion along lines such as *these* are easily and straightforwardly construed as arriving at a *reasonable expectation concerning a particular relative frequency* to be encountered in large numbers of ‘trials’ on the basis of *reasonable expectations concerning certain other relative frequencies* that would be encountered in large numbers of ‘trials.’ In that event, the application of Bayes' theorem just described can be viewed as employing the non-metric concept of epistemic probability as explicated in this paper.<sup>50</sup>

### 8.1.3 Should we recognize a metric concept of epistemic probability?

With examples such as these in mind – and given an “objectivist” account which ties the probability (or chance) of kinds of event to relative frequencies (and does so in a manner more or less consistent with the probability calculus as standardly conceived) – we might be tempted to define a *metric* concept of *epistemic probability* by equating statements of the form

- 1) The *epistemic probability* of an event of type  $A$  given an event of type  $B$  is equal to  $n$

with statements of the form

- 2) It is *reasonable to expect that the relative frequency* of events fitting description  $A$  in any large sequence of events fitting description  $B$  will fall within an interval defined by  $n$  plus or minus some small amount  $\epsilon$ .

where the considerations which make the expectation mentioned in statements of form (2) *reasonable* involve a suitable application of the concept of objective chance.

Savage (1954, p 4) has cited as a shortcoming of objectivistic accounts of probability that they “can apply fruitfully only to repetitive events” and that therefore it is impossible to apply a probability other than 0 or 1 to “the truth of a proposition” – a point that Reichenbach (1938, p. 309) had recognized

many years before as the problem of “the applicability of the frequency interpretation to the single case.” Reichenbach addressed that problem by drawing on a concept of the “weight” of a statement about a single case.<sup>51</sup> We might consider extending an account of metric epistemic probability so that it applies to “single cases” along the Reichenbachian lines briefly described in note 51.

Whether introducing a concept of metric epistemic probability along such lines would prove fruitful depends on whether equating (1) and (2) will turn out to make sense, not just in the few sorts of example I’ve cited in section 8.1.2 above, but also across the broad range of cases in which the objective chance plays a role in epistemic appraisal. At the present time I simply don’t know whether that will turn out to be the case – but it strikes me as a possibility that deserves further investigation.

## 8.2 “BAYESIAN” ACCOUNTS OF NUMERIC PROBABILITY

When philosophers and statisticians talk about Bayesian approaches to inductive inference or to statistics, they have in mind uses of Bayes’ theorem importantly different from the use described in the subsection 8.1.2 above – they have in mind a use in which  $h$ ,  $e$  and the  $H_i$  are not properties or kinds of “event”, but are either propositions or else are concrete events. In “subjectivist” versions of Bayesian approaches (whose classical expressions are found in de Finetti 1937/1964 and Savage 1954), the unconditional probabilities in Bayes’ theorem are taken to correspond to a person’s degree of confidence in the proposition  $h$  (measured by the odds which that person considers fair odds for betting on the truth or occurrence of  $h$ ) and conditional probabilities are usually understood, not after the manner of Kolmogorov,<sup>52</sup> but in terms of a certain kind of conditional bet.<sup>53</sup> On subjectivist accounts, the only strict normative constraint on a person’s degrees of confidence is that, taken together, the probabilities or odds assigned obey the laws of the probability calculus – in which case a person’s degrees of confidence are said to be coherent.<sup>54</sup> However, when a person’s degree of confidence in some particular proposition  $e$  is changed by external events (via perception, for example), his/her distribution of probabilities will (usually?) need to be revised in order to remain “coherent.” In that event, subjective Bayesians recommend that degrees of confidence be “rationally revised” by a very particular application of Bayes’ rule.<sup>55</sup>

The Bayesian recommendation for revising degrees of confidence has considerable intuitive appeal – in part because it appears to shed light on how and why the empirical “consequences” of a hypothesis are what lend it support, while construing the relevant “consequence relation” probabilistically by making it depend on the conditional probability of (possible) evidence  $e$  given the hypothesis  $h$ . Moreover, in many if not most accounts of Bayesianism, the principal “subjective” element” lies in the prior probability of the hypothesis  $h$  with which one starts. And this is said to be tolerable because with sufficient applications of Bayes’ theorem in light of new evidence, the posterior probabilities “swamp” the priors, so that even if your initial estimation of probability of  $h$  is wildly off the mark, the “posterior” probabilities you assign to  $h$  will eventually get better and better as long as you continue to revise them by applying and re-applying Bayes’ theorem in light of new empirical evidence.<sup>56</sup>

Quite apart from the *philosophical* attractions the Bayesianism program may offer, that program remains an option that must be taken into account in any discussion of concepts or numeric probability, because among *statisticians* there remains a vigorous ongoing debate between objectivist/frequentist statisticians and Bayesian statisticians about the preferred *statistical* methods for addressing various problems in empirical research.

## 8.3 PLURALISM AGAIN

In my view, the objectivists and/or frequentists, on the one hand, and the Bayesians on the other are using the word ‘probability’ to refer to different things, and as a pluralist concerning the word

‘probability’ I see no reason in *principle* for supposing that either use of the term is illegitimate. Moreover, as I see it, adopting the concept of metric epistemic probability put forward for consideration in sub-section 8.1.3 (which presupposes a concept of objective chance, as well as the non-metric concept of epistemic probability developed in this paper) would not require us to deny the legitimacy or the usefulness of the concept of degree of confidence or degree of belief elaborated by Bayesians and/or defenders of “subjective probability.”<sup>57</sup>

However, even though I think it is simply a mistake to ask whether it is the Bayesians or the objectivists who are “right” about what non-epistemic probability “really is,” I think there remain important open questions about the relative *fruitfulness* of Bayesian versus objectivist *methods* for addressing one or another specific problem in the statistical design and interpretation of empirical research. But those questions about relative fruitfulness are, I think, best addressed by statisticians and empirical scientists rather than by philosophers. The proof of the pudding is, after all, in the eating.

## 9. CONCLUSION

In the opening paragraph I said this paper was an attempt to elaborate a particular account of what I believe to be the fundamental *epistemic* sense of probability. The account of epistemic probability elaborated here is contained in the idea that to say something of the form “Probably  $p$ ” or “It is probable that  $p$ ” is to say that all things considered it is *reasonable to expect* that it will turn out to be the case that  $p$ . At the heart of the elaboration undertaken is the attempt to provide a *functional* account of expectation as a doxastic attitude, and to do so in way that doesn’t draw on a prior notion of probability. The functional account offered here

- (a) emphasizes the role that expectation – as contrasted with both belief and acceptance (or “talking for granted”) – plays in practical reasoning, and most especially in the elaboration of “branching plans”,
- (b) recognizes a central role that beliefs or suppositions about relative frequency play in what leads to such expectations and renders them reasonable., and
- (c) recognizes that the propositional content of expectations can consist in statements about the relative frequency with which we will encounter situations of type A among situations of type B *in the future*, or among “*unexamined*” situations of type B.

That final point (c) holds out the possibility that the “non-metric” sense of epistemic probability elaborated here can shed light on – and perhaps demystify – quantitative talk about probability in connection with situations to which the so-called “probability calculus”, and projective statistics in particular, are regularly applied for purposes of epistemic appraisal.

If I have succeeded in offering a plausible functional account of expectation in this paper, I will have offered a partial defense of the fourth “guiding idea” – point (d) – mentioned in its opening paragraph. If so, then a reader who also finds some plausibility in the first three “guiding ideas” mentioned in that paragraph – points (a)-(c) – ought to concede that the concept of epistemic probability elaborated here is one which deserves serious further consideration.

## APPENDIX: SELLARS ON PROBABILITY AND INDUCTION

1. In 1964 and 1970 Wilfrid Sellars published two papers that attempted a reconstruction of what is usually thought of as inductive reasoning – a reconstruction in which “at the heart of the concept of probability is the concept of a [certain] form of practical reasoning.”<sup>58</sup> Though this pair of papers outlines a carefully constructed and coherent account of probability judgments and the reasoning which supports them, they have been largely overlooked.<sup>59</sup> Since few readers are likely to be familiar with the content of these papers (and given their complexity – which is especially steep when it comes to the 1964 paper – are unlikely work through them), I am including an overview of their content here.

I should confess the fact that my own interest in these papers was began when I discovered parallels between what Lehrer (1973, p. 81) has called the “pragmatism” of Sellars 1964 and pragmatic themes in two of my recent papers. The parallels are evident in two features of Sellars’ account

- a) the central role played by what he calls “ends-in-view” in the account he offers of the practical reasoning that lies behind of the concept of the concept of probability
- b) the idea that what motivates or authorizes the acceptance of propositions we call probable is the adoption of *policies* necessary for achieving those “ends-in-view” (see the references in note 66 below).

Thus the importance Sellars accords to *ends-in-view* parallels the role I claimed for *epistemic and nonepistemic purposes* in Pinto 2003a<sup>60</sup> and Pinto 2006. And the role which Sellars accords to *policies* adopted in light of those ends-in-view has obvious parallels to the account of the role of *warrants* which I offer in part 6 of Pinto 2006.

2. At the heart of what Sellars is up to is a very particular epistemic reading of the classificatory, nonrelational<sup>61</sup> use of ‘probable’. Consider Sellars’ gloss on ‘probable’ (1964, p. 198):

In the basic non-metrical sense of “probable” (in relation to which all other senses are to be understood), to say of a statement or proposition that it is probable is, in first approximation, to say that it is worthy of credence, that it is acceptable in the sense of being worthy of acceptance; that is, to put it in a way that points to a finer grained analysis, it is to say that all things considered there is good reason to accept it.

As is apparent from this passage, one of the things Sellars wants to do is to show how the “metric” or quantitative uses of ‘probable’ can be understood in terms or in light of “the basic non-metrical sense of that word” (see note 1 on p. 197 and parts XIII-XVI of Sellars 1964). The reader can judge for himself or herself to what extent he is successful in accomplishing this particular goal – I will set that issue aside in this appendix.<sup>62</sup> What interests me here is rather the reconstruction of the *reasoning* that, in Sellars’ account, underwrites our judgment that one or another proposition is probable “full stop” and the relationship of that *reasoning* to explicit *statements* about probability.

3. An introductory overview of Sellars account can be found in Sellars 1970; its full details are set out in Sellars 1964. The basic strategy in Sellars reconstruction is, I think, nicely captured by Keith Lehrer when he says (Lehrer 1973, p. 81):

Sellars' theory of inductive inference is basically pragmatic. Inductive arguments, as Sellars conceives of them, have conclusions affirming that it is epistemically reasonable to accept some specified statement. The reasonableness of accepting such a statement is explicated in terms of the effectiveness of such acceptance for achieving epistemic objectives relevant to the kind of statement in question.

Oversimplifying more than just a little,<sup>63</sup> the key ideas in Sellars' reconstruction to which I want to call attention<sup>64</sup> are the following.

- What makes it true that it is probable the  $p$  – i.e., that all things considered it is reasonable to accept that  $p$  – is that there exists *a good argument of a certain sort* for accepting  $p$ .<sup>65</sup>
- The *sort* of argument in question does *not* have as its conclusion either the proposition that  $p$  or even the proposition that it is probable that  $p$ . Rather, it has as its conclusion something like “I shall accept that  $p$ ”.
- The premisses from which that conclusion is derived consist of
  - (1) a statement that encapsulates an epistemic objective, and is of the form “I shall accept a proposition if it satisfies  $C$ ”<sup>66</sup> and
  - (2) a statement of the form “ $p$  satisfies  $C$ ”.

Sellars wants to say that the logic of this argument is “deductive”<sup>67</sup> – in Sellars 1970, his answer to the question in its title “Are there non-deductive logics?” is that there are not. But he also wants to insist that this argument is a piece of deductive *practical* reasoning in which the “major premise” and the conclusion “I shall accept that  $p$ ” do not express *truths*, but rather express *intentions*.<sup>68</sup>

Though the acceptance of  $p$  is (or ought to be) the “*terminal outcome*” of such reasoning, ‘ $p$ ’ is not the “*conclusion*” of the practical reasoning. The conclusion of the practical reasoning (‘I shall accept that- $p$ ’) stands in a very special relationship to the acceptance of  $p$ : it *authorizes* the acceptance of  $p$ .<sup>69</sup>

4. The conclusion of the practical reasoning just alluded to (‘I shall accept that  $p$ ’) is itself *not* a probability statement, and the argument which captures that reasoning is not a “probability argument.” Sellars says (p. 201) that on his view “there are at least two arguments in the logical neighborhood of every probability statement”:

- one is the *practical* reasoning mentioned in the preceding section which has the conclusion “therefore, I shall accept that- $p$ ”
- the other, which he calls “a first order probability argument,” stands to the *practical* argument “roughly, as meta-argument to object-argument” and has as its conclusion “therefore, it is probable that- $p$ ”.<sup>70</sup>

In addition to such “first order probability statements as ‘it is probable that  $p$ ’”, Sellars also recognizes “second order probability statements” (p. 203) which are very roughly of the form

It is probable that- $p$  in relation to  $q$

According to him, those second order probability statements simply report, in effect, certain key premisses that occur in the “practical argument” whose goodness makes “It is probable that  $p$ ” true.

5. Despite the fact that I find many aspects of Sellars' account attractive, serious questions can be raised about several of its features. To begin with, even from this rather crude sketch one can begin to see that questions almost immediately arise about what the “acceptance” Sellars is talking about amounts to.

- a) For one thing, as Sellars himself points out in connection with the account of the reasonable acceptance of singular statements summarized in note 68 above, even though that account licenses the acceptance of every affirmative answer to the question “Is  $a_i$  B?”, it does not license the acceptance of the conjunctive assertion of all those affirmative answers – a

conjunction we would know to be false whenever we knew that only a majority of the members of K are B. Our account of “acceptance” will have to take account of “the dangers of ‘conjunction introduction’ which notoriously hover around probability” (Sellars 1964, 222) – that is to say, we will have to recognize that what Kyberg later called ‘conjunctivis’ is an error.<sup>71</sup>

- b) For another, Sellars insists (p. 228 and *passim*) that it can be reasonable to *accept* a hypothesis which it is not reasonable to *act on* – a point developed in the final Part (XVIII) of Sellars 1964. Without attempting a detailed critique of the way Sellars handles this point, let me simply indicate that I think it is not entirely satisfactory.<sup>72</sup> Sellars’ story here points to the need further elaboration of what “acceptance” amounts to – in particular with respect to the role such acceptance is to play in the context of deliberation.
- c) Sellars’ gloss of “It is probable that *p*” as “It is reasonable all things considered to *accept* that *p*” does not help in explaining why saying that it’s probable that *p* carries the implicature that the propositional content represented by *p* is “less than certain” – that our attitude toward it ought to be something *less* than “full” acceptance.
- d) Finally, these questions lead straight to issues raised by Adler’s (2002, p. 235) objection to Toulmin’s view that saying ‘Probably *p*’ is guardedly asserting that *p*. For Adler’s objection turns on his claim that “[e]pistemically qualified assertions are not truly assertions.” If that is correct (as I’m inclined to think that it is) then we are faced with the question of what *sort* of attitude toward *p* is appropriate when it is correct to say, “Probably *p*.’

It is questions such as these that lead me to propose a variant on Sellars’ account in which to say of a proposition that it is probable is to say that it is reasonable all things considered to *expect* it will turn out to be true.

Moreover, there is at least one further respect in which Sellars’ account requires, by his own admission, further elaboration. As it is presented in Sellars 1964, the conclusion of the “practical argument” whose existence renders a first-order probability statement true is of the form “*I shall accept that p*”. Accordingly, speaker *S*’s assertion that it is probable that *p* would seem to say only that it is reasonable for speaker *S* to accept that *p*. In a later piece (Sellars 1970, 101-102), Sellars makes it clear that this can’t be the whole story – that “probability statements are intersubjective” and the “It is probable that *p*” must have something of the sense of “It is reasonable (for us, now) to accept ‘*p*.’” These are additional details that remain to be worked out (though I won’t attempt to do so in this appendix).

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## NOTES

<sup>1</sup> Whether Carnap is historically right about its *original* use is debatable. A somewhat different picture is presented in Ian Hacking's revealing accounts of the emergence of the modern concept of probability, which he dates from the late 17<sup>th</sup> century, and in which he treats the quantitative or at least comparative aspects of the emerging concept as essential to what emerges at that time. Consider the following comment (Hacking 1975, p. 1) about the concept whose history he is tracking: "Probability has two aspects. It is connected with the degree of belief warranted by evidence, and it is connected with the tendency, displayed by some chance devices, to produce stable relative frequencies." Moreover, in Hacking's account, before about 1660 probability was an attribute of "opinion" as contrasted with "knowledge", and a probable opinion was not one supported by evidence, but rather one which was approved by some authority – see chapters 3 and 4 of Hacking 1975.

<sup>2</sup> Compare (Toulmin 2003/1958, 83-84): "By qualifying our conclusions and assertions in the ways we do, we authorise our hearers to put more or less faith in the assertions or conclusions, to bank on them, rely on them, treat them as correspondingly more or less trustworthy."

<sup>3</sup> In Pinto 2006 and Pinto 2009 I argued that recognizing the existence of a range of such doxastic attitudes can motivate a viable version of what I called *qualitative evidence proportionalism*.

<sup>4</sup> Toulmin's idea that the function of 'Probably' and 'Probable' is to express guarded commitment or assertion plays little or no role in this paper. For my comment on that idea, see note 14 below. However, in section 2.2 and 3 below I draw on what I think are more important aspects of Toulmin's treatment of 'probable' in *Uses of Argument*.

<sup>5</sup> Although the verb 'expect' typically carries a strong connotation of anticipating a future event, the Oxford English Dictionary recognizes that it can have a much broader meaning as well. In its entry for 'expect', the sixth sense listed is as follows: "To anticipate that it will turn out to be the case that; hence, to suspect, suppose, surmise." It adds that this sense is "[now] rare in literary use" and that "[t]he misuse of the word as a synonym of suppose, without any notion of 'anticipating' or 'looking for', is often cited as an Americanism, but is very common in dialectal, vulgar or carelessly colloquial speech in England."

<sup>6</sup> Toulmin's account of 'probably' in Toulmin 2003/1958, chapter 2, was developed in explicit contradistinction to the views of Kneale and of Carnap current in the 1950s, and is particularly critical of the notion that (epistemic) probability is essentially a relationship of hypothesis to evidence. Though I am sympathetic to Toulmin's point, I have never found his arguments against Kneale or Carnap compelling.

For a more satisfactory treatment of the question of this issue, see Sellars 1964, pp. 198-199, where the idea that *probability* must be a *relation* is criticized as a "non-sequitur." Sellars claims that taking "probable" to be a "relation word" would be analogous to taking 'father' in the sentence "Tom is a father" to be a relation word. However, he is quite prepared to say that although being probable is a property and not a relation, like fatherhood it is a relational property. See also Sellars 1964, pp. 200-204, where Sellars discusses the relationship between "It is probable that p" and "Evidence e makes it probable that p."

<sup>7</sup> See the Appendix of this paper for an overview of Sellars' view of probability and induction, from which this quotation is drawn. Section 5 of that Appendix sets out the problems I see in Sellars' use of the term "acceptance" in stating his view. At the core of Sellars 1964 (as well Sellars 1970, which provides a somewhat simplified account of the views expounded in Sellars 1964) is a distinctive account of "inductive" reasoning or inference. In this paper, I do not attempt any such account, although as I note in section 1 of the Appendix there are at least two similarities between Sellars' account of such reasoning and the account of good inferences that are not deductively valid that I have tried to give in two recent papers.

<sup>8</sup> He says (Ennis 2007a): "To affirm 'It is probable that P' (where 'P' is a declarative sentence) is to affirm that a guarded committing – to the view that P – is justified." I have come to differ from Ennis on one crucial point. Ennis insists (2007, p. 150, point 3) that the basic meaning of 'Probably p' is distinct from the meaning of 'It is probable that p.' I am disinclined to make that distinction. Ennis himself concedes (in responding to the charge made by Searle [1969, pp. 136-141] that Toulmin's account of 'probably' is an example of "the speech act fallacy") that in a range of subsidiary contexts



the phrase ‘probably *p*’ is in fact used to convey the idea that a guarded committing is (or would be) justified (Ennis 2003, pp. 160-161).

<sup>9</sup> That is to say, *having a reason* to do *A* can be, but need not be, a *cause* of doing *A*. With Goldman (1979) I would distinguish between being justified in believing *ex post* and being justified in believing *ex ante*, where the latter (as contrasted with the former) does not presuppose that one actually believes what one is justified in believing. To my mind, Goldman’s distinction maps on to the distinction made by Biro and Siegel (1992, note 26 on p. 101) between doxastic justification and propositional justification: “The former sort of justification [i.e., propositional justification  $\approx$  Goldman’s *ex ante* justification] obtains when a proposition is rendered likely to be true by a person’s total evidence, whether or not that person believes it or believes it for the wrong reason.”

<sup>10</sup> Can we say that, subject to second proviso, having a good undefeated reason for doing something is a *necessary* – as well as a *sufficient* – condition of its being reasonable to do it? In my estimation, we can answer yes to that question so long as we are prepared to recognize that conscious states (such as experiences) which themselves are not appraised as reasonable or unreasonable can function as reasons for adopting or holding propositional attitudes. See for example what Pryor (2005) has to say about what he calls “immediate justification.” See also Pinto (2009, section 8, especially notes 25, 26 and 27).

<sup>11</sup> Of course, whether those grounding attitudes entitle me to hold or adopt a grounded attitude depends in part on (i) whether I am *entitled* to those grounding attitudes (see Pinto 2006 for elaboration of the idea that the principle virtue of inferences is “entitlement *preservation*”) and (ii) whether or not the grounding reasons are *genuine* reasons for holding the grounded attitude (see Pinto 2009, part 4).

<sup>12</sup> It has been fairly widely recognized that when we talk about what is possible, we are often not talking about what is “logically possible” or what is “causally possible.” Thus G.E. Moore (1962, pp. 187-88), Ian Hacking (1967) and more recently Anand Vaidya (2007) have called attention to a sense of ‘possible’ in which a state of affairs may be said to be “epistemically possible.” For example, Hacking’s “working hypothesis” (1967, p. 149) is that in this sense of ‘possible’, “a state of affairs is possible if it is not known not to obtain, and no practicable investigations would establish that it does not obtain.”

However, what Toulmin is getting at in the passage that follows is not epistemic possibility in anything like Hacking’s, Moore’s or Vaidya’s sense. Rather, Toulmin is talking about a context- or field-dependent status that a proposition can have that is very much like the status of what Dretske (1970, 1981) and Goldman (1976 and chapter 3 of 1988) call “relevant alternatives” in a given epistemic context. For Goldman and Dretske, the relevant alternatives to a proposition *p* in a context *C* are those alternatives to *p* that must be ruled out by a body of evidence *E* if *E* is to conclusively establish that *p* in context *C*. In Dretske’s words (1961, p. 373), “A relevancy set ... is a set of situations each member of which contrasts with what is known to be the case, and must be evidentially excluded if one is to know.” Dretske proceeds (1981, pp. 373-378) to “stick [his] neck out by saying what some of the considerations are that determine the membership of these sets,” but admits that he does “not expect much agreement.” Goldman (section I of 1976) recognizes a general problem concerning what determines which alternatives are “relevant,” and sketches two very general approaches to solving that problem which are much less specific than what Dretske offers, though Goldman does not go so far as opting for one or the other general approach.

Like “alternatives that are not relevant,” the states of affairs which are *not* possible in the sense of ‘possible’ that Toulmin is talking about are the states of affairs which, in the context at hand, do not need to be taken into account.

<sup>13</sup> Jean Goodwin has objected to identifying the possible with what deserves to be considered, observing (in correspondence) that she “[doesn’t] think all possible restaurants deserve to be considered.” I agree with her that in contexts of deliberation not every possible course of action is an option worth considering – see for example the second constraint I place on options worth considering in Part VI below. Perhaps we should say: what is possible is what deserves *prima facie* to be considered, but there can be reasons for not considering it which override its *prima facie* entitlement to consideration. This may provide a way of understanding Fred Kauffeld’s suggestion – made in response to Goodwin’s initial objection – that we don’t *have to* consider everything worth considering.

<sup>14</sup> It is in this chapter that Toulmin famously maintains that ‘Probably *p*’ expresses guarded commitment to or guarded assertion of the proposition that *p* – a view which I find problematic since I don’t think it is sufficiently clear what it is for a commitment or assertion to be “guarded.” I agree with Jonathan Adler when he says (2002, p. 235):

Epistemically qualified assertions are not truly assertions. Toulmin captured this crucial point without, however, developing it: "To say 'Probably *p*' is to assert guardedly, and/or with reservations, that *p*" .... Since the central aim of the exchange is to transmit the information that *p* (all-or-none), the qualified expression (manifestly) falls short [of truly being an assertion].

Adler's reasons are connected with his view about the connection between assertion and belief ("Only (full) belief that *p* warrants its simple assertion") and his distinctive view about the nature of (full) belief. But even if we put Adler's views about the nature of belief aside, we ought to acknowledge that Brandom is fundamentally correct when he claims (Brandom 1994, 168) "that assertions are fundamentally fodder for inferences" and that

[u]ttering a sentence with assertional force or significance is putting it forward as a potential reason. Asserting is giving reasons – not necessarily reasons addressed to some particular question or issue, or to a particular individual, but making claims whose *availability* [emphasis added] as reasons for others is essential to their assertional force.

But it is far from clear whether, how, or when saying 'Probably *p*' makes the proposition that *p* straightforwardly available as a reason in subsequent inferences. Accordingly, I propose the following "revision" of Toulmin's claim about guarded assertion:

Saying 'Probably *p*' is *analogous* to asserting that *p* in the following respect: where *p* is a declarative sentence, to utter '*p*' in typical circumstances is to authorize one's audience to *accept* that *p* as a straightforward basis for inference, whereas to say 'Probably *p*' is to authorize or license one's audience to *expect* that *p*.

Moreover, this seems to me to be quite consonant with what Toulmin himself says (2003/1958, pp. 83-84), namely :

By qualifying our conclusions and assertions in the ways we do, we authorise our hearers to put more or less faith in the assertions or conclusions, to bank on them, rely on them, treat them as correspondingly more or less trustworthy.

<sup>15</sup> In this and the subsequent passages I quote in this section, I have added emphasis to the expressions which make it clear that what Toulmin is saying has epistemically normative force.

<sup>16</sup> I would construe the term 'expectability' on the model of the term 'desirability,' and take it to invoke the idea that something *ought* to be expected, that it is *reasonable* to expect it.

<sup>17</sup> There is, of course, no incoherence if I affirm, "It is probable that it will rain tomorrow but Sam doesn't expect that that it will."

<sup>18</sup> Adler adds (p. 232): "Expressions for partial belief are not the same as (objective) probability judgments, for example, 'The probability that the coin will land heads is 3/5.' Probability judgments attribute properties, dispositions, or propensities to objects. Although they can, of course, be based on evidence, expressions of them are not incomplete without mention of evidence. However, the two are easily confused, since, for brevity, in expressing our partial beliefs, we cut away from reference to the believer or his evidence. Typically, we say 'It's probable that Mary will meet us' just as we say 'It's possible that Mary will meet us.' In either case what is usually meant involves a disguised reference to the asserter (and his evidence) – it's probable or possible, given the asserter's beliefs."

<sup>19</sup> Bratman (1999, p. 30, note 20) recognizes a similarity between his concept of context-relative acceptance and Cohen's concept of acceptance. However, in that note he criticizes aspects of Cohen's treatment of the distinction between belief and acceptance along lines quite similar to those that I (quite independently of Bratman) have criticized it. For my criticisms of Cohen, see Pinto (2003b/2009).

<sup>20</sup> For five interesting sorts of example, see Bratman 1999; section III of chapter 2, pp. 20-26, as well as examples in Pinto 2003b/2009.

<sup>21</sup> See Pinto 2003b/2009 and Pinto 2003a.

<sup>22</sup> Along these same lines, we can explain why considerations which warrant believing that *p* may not warrant accepting *p* in a particular context and therefore may not warrant acting on *p* in that context. Such explanations can, I think, help deal with the problem posed at the end of chapter 9 of Adler 2002 (pp. 238-247). The waiter in Adler's example is justified, because he knows he has carried out his normal procedures, in *believing* that the cup he is carrying contains decaffeinated coffee, but he is not warranted by just those consideration in *accepting* that proposition as a premiss in

context in which he must decide whether to serve the cup of coffee to a customer whom he know or believes suffers from arrhythmia.

<sup>23</sup> Compare Bratman (1999, p. 28): “If in a certain context I treat the possibility of not-*p* as non-serious I am (to use my terminology) accepting, in that context, that *p*.” Bratman makes this point in the course of distinguishing his view from that of Isaac Levi, who had insisted that a rational agent “be committed to a single standard for serious possibility both for theoretical inquiry and for practical deliberation” – the quotation from Levi is as reported by Bratman on p. 28.

<sup>24</sup> Compare Adler (2002, pp. 36ff.), where it is maintained that the reasons adequate for justifying belief (and he means full or unqualified belief) must be *conclusive* reasons. Though Adler does not spell out in detail why it is necessary for a reason to be conclusive, there are strong hints on p. 37 that conclusive reasons for believing that *p* must rule out any “serious” possibility that would render it false that *p*.

<sup>25</sup> Compare Bratman (1987, pp. 36-37): “None of this [i.e., what he has said about the importance of flat-out belief] assumes that there is a simple relation between flat-out belief and degrees of confidence. In particular, it does not assume that to believe flat-out that I have only one car I must assign this proposition a subjective probability of 1. If you were to offer me a bet in which I pay one dollar if I own only one car but receive one million dollars if it turns [p. 37] out that I own a second car, I might well accept this bet; for I judge that there is better than a one-in-a-million chance that, unknown to me I own a second car. (Perhaps my aunt has just died and left me her car in her will.) Still, though I would take such a bet if offered, I believe flat out that I own just one car. What makes my attitude toward my having just one car one of flat-out belief, and not merely the assignment of some probability somewhat less than 1, is, at least in part, its distinctive role in the background of my further planning-in particular its role in providing a screen of admissibility for my options.” But see also his remarks in Bratman 1999, pp. 28-29, especially his comment that “practical pressures can make it reasonable of me to accept that *p* in a certain practical context even if it is not reasonable of me to assign *p* a probability of 1 in my theoretical reflections.” It is unclear to me exactly how this latter comment fits with the passage I just quoted from Bratman 1987.

<sup>26</sup> Adler has also argued that doubt is compatible with full belief – see especially his defense of that view in chapter 10 of Adler 2002. Though I am personally not completely comfortable with the arguments Adler advances for that thesis, I think it is quite correct that straightforwardly believing a proposition is consistent with varying degrees of confidence in that proposition – that I can be “more certain” of some of the things I believe than I am of others. That is why in Pinto 2003b, pp. 6-7, in addition to acceptance attitudes and to doxastic attitudes, I recognized degrees of confidence as a third, distinct category of cognitive attitude.

<sup>27</sup> What is probably the case is what it is *reasonable* to expect is the case. Analogously, what is presumptively the case is what we are *entitled* to presume is or will be the case.

<sup>28</sup> I am indebted to Jean Goodwin for calling my attention to the importance of this point.

<sup>29</sup> Pollock (1995, chapter 6, section 4) offers a what appears to be a quite different way of conceiving of the “expected value of a plan,” which I don’t attempt to consider or deal with here.

<sup>30</sup> An analogous point can be found in Pollock 1995: “When an agent selects a goal it comes to want or desire it,” and “[a]dopting a goal initiates planning for its achievement” (p. 25). An intention arises when, as a result of deliberation, a plan is adopted: “the states that do this [i.e., encode the adoption of a plan] are *intentions*” (p. 28).

<sup>31</sup> I.e., as Bratman says on p. 16, they tend to ‘resist reconsideration.’ The question of when an existing intention ought to be considered is the subject of chapter 5 in Bratman 1985, and is revisited in chapter 4 of Bratman 1999.

<sup>32</sup> It seems to me that an important difference between desires and intentions is that it is not irrational to have incompatible *desires* (wanting to stay married Louise and the same time that I want to obtain a position open only to unmarried persons), whereas it is usually *not* rational to have incompatible unconditional intentions (e.g. planning to stay married Louise while planning to obtain a position open only to unmarried persons). In general, two conative states are incompatible if it is impossible to satisfy both of them.

<sup>33</sup> In this context, I take “I have a chance of winning” to mean “There is a genuine possibility of my winning.” In other words, I do not intend that by invoking that phrase I am sneaking in considerations of numeric probability.

<sup>34</sup> Here’s another example, adapted from an example Bratman uses for a somewhat different purpose. There is a large rock in my yard that obstructs the view. I’d really like to get it out of the way, but I can’t afford to hire someone to move it. I don’t expect to be able to move the rock myself, but I decide to try – and spend an entire day discovering I can’t make the

rock even budge. Surely it was worth a try – assuming I had nothing better to do on the day I spent trying to budge the rock. Here again I want to say that there were expected benefits, distinct from the benefit *hoped* for. They include the benefit of finding out whether the rock could be moved without hiring somebody to do it and the benefit of not passing up a chance of moving it.

<sup>35</sup> I may, and in most situations probably will, have good *prima facie* reasons for settling on several *incompatible* courses of action – incompatible in the sense that it will not be “realistically” possible for me to carry out more than one of them. In such cases, I will have to rank the “net benefits” of those courses of action, and choose the course of action whose net benefits I rank first. In the event that two or more courses of action “tie” for first place – i.e., I do not prefer then net benefits of one of them over the net benefits of the others – I must fall back on flipping coins.

<sup>36</sup> This is one of the reasons why, in formulating P3 above, I used the phrase “assume or expect” rather than just “expect.”

<sup>37</sup> The considerations analogous to those mentioned in note 35 above, which come into play when there good *prima facie* reasons for two or more incompatible course of action, will come into play when there are good *prima facie* reasons for including two or more incompatible branches in a plan.

<sup>38</sup> In this regard, it is worth recalling that a variety of different *sorts* of inferences can involve assumptions about relative frequencies. Among this variety are the following four:

- 1) Inferences involving assumptions about the relative frequency of As in the *population* of Bs to a conclusion that a particular B is (or is not) an A – some call this *statistical syllogism*
- 2) Inferences involving assumptions about relative frequencies in the composition of a *sample* drawn from a population to a conclusion about relative frequencies in that population – I call this *projection*
- 3) Inferences involving assumptions about the relative frequency of As among “examined” Bs to a conclusion about whether a particular unexamined B is an A – I call this *prediction* (in my view, in the typical case prediction is what actually underwrites so-called statistical syllogism, since in the typical case we reason from an *estimate* of the relative frequency of As in a population of Bs that is based *projection* from a sample to that population)
- 4) Inferences involving assumptions about relative frequency of As among “examined” Bs to a conclusion about the relative frequency of As among large groups of yet to be examined Bs – I call this *extrapolation*

<sup>39</sup> I am indebted to Jonathan Adler for reminding me of the importance of calling attention to the fact the considerations of relative frequency do not *by themselves* suffice to warrant expectations.

<sup>40</sup> ‘Objectivists’, rather than frequentists, is the term Savage (1954, pp. ) originally used for those he later (1964) called frequentists. As I am using that term, it is intended to include those, like Popper and perhaps Hacking, who subscribe to “tendency” theories as well as those more commonly called frequentists.

<sup>41</sup> Early “frequentists” often *defined* the probability of A given that B –  $P(A|B)$  – as the limit which the ratio of A’s to B’s approaches as the number of the Bs tends to infinity. It is usual to cite both von Mises and Reichenbach as examples of those who offer such definitions. Though it appears that no such definition occurs in Reichenbach’s 1935 *Theory of Probability*, Reichenbach (1938, p. 341) does say that “the theory of probability needs the definition of probability as the limit of a frequency.” Moreover, in 1938 he says (p. 350) that “[t]he aim of induction is to find a series of events whose frequency of occurrence converges to a limit.”

<sup>42</sup> For a brief and very simplified account of Neyman’s concept of “inductive behavior” see Hacking (2001, chapter 19, esp. p. 242). Not every important representative of objectivist or frequentist accounts of probability follow Neyman in avoiding the concept of inductive inference in favor of an account of “inductive behavior”; in particular, R. A. Fisher (1973, Chapter IV, esp. pp. 104-107) attacks Neyman’s idea that “Inductive Reasoning does not exist, but only ‘Inductive Behaviour’” and in Chapter V offers an account of inductive reasoning. Savage (1964, p. 177) sees the frequentists as divided between Fisher and those who follow him, on the one hand, and Neyman and Pearson and those who follow them on the other.

<sup>43</sup> Or in the phrasing used by (Hacking 2001: 236), “On the basis of our data, we estimate that an unknown quantity lies in an interval. The estimate is made according to a method that is right with a probability of at least 0.95.”

<sup>44</sup> There are three distinguishable sorts of relative frequency at issue in such claims: (A) the relative frequency of Q in a sample S drawn from a population P and in other samples drawn as S was drawn from population P, (B) the relative frequency of Q in the population P and (C) the relative frequency (e.g., 19 times out of 20) with which samples drawn from population P – by a method like that used in drawing S from P – will “over the long run” assign to Q a relative frequency that falls within the confidence interval plus or minus  $\epsilon$  of its relative frequency in the population P. I take the explicit numeric *probability* claim – which is the one that I take to have epistemic implications – to be equivalent to the claim that *it is reasonable to expect* that “over the long run” the third relative frequency C will obtain.

<sup>45</sup> A full discussion of this interpretation would require an explanation of why it is reasonable to think that the *mathematical reasoning which lies behind the “probability estimation”* applies to the real life case at hand – a question that arises because the empirical methods of sample selection in real life applications fall short in several respects of the idealized conception of sample selection assumed in the mathematical reasoning that yields the objective probability that the relative frequency in the sample will be within a given confidence interval of the relative frequency in the population .

<sup>46</sup> For example, suppose the “statistic” in question is a difference of a certain magnitude between the means for a particular “random variable” between a test group and a control group. Then “data like those we obtained” would consist of data in which the magnitude of that difference between those means is *at least as great* as the difference in means that we obtained.

<sup>47</sup> Insofar as a decision to accept or reject a null hypothesis is based on such tests of statistical significance, it is sensitive to the likelihood of committing a Type I error in rejecting the null hypothesis. Such decisions can also take into account the *power* of the test we are using, where the power of a test is 1 minus the probability of making a type II error in rejecting the null hypothesis on the basis of the test. Here again, we can also see ourselves as accepting or rejecting the null hypothesis on the basis of the relative frequency of a type II error that it is *reasonable to expect*.

<sup>48</sup> There is still another form (call it version 3), in which ‘h’ in the left hand side and in the numerator of the right hand side is replaced by  $H_j$  (where  $H_j$  is a member of a set  $H_i$  of mutually exclusive and jointly exhaustive “hypotheses” or situation types) and the right hand denominator is replaced by

$$\Sigma[P(H_i) \times P(e/ H_i)].$$

<sup>49</sup> Rather than the subjective or personal “degrees of confidence” that do the work in subjectivist Bayesian approaches.

<sup>50</sup> A slight complication arises with respect such an interpretation, insofar as strictly speaking adjunction does not apply to expectations. For purposes of this preliminary exposition, I am simply ignoring that complication for the time being.

<sup>51</sup> About which he said (1934, p.314), “A weight is what a degree of probability becomes when applied to the single case.” The weight to be assigned to a single case (e.g., that Mr. X dies in 2040) will be the probability of some class of events to which the single case belongs. This gives rise to the problem (p. 318) of *which* class of events is to determine the weight we assign to a single case (e.g., is it deaths of Canadian males, or deaths of men with coronary artery disease, etc.?). Reichenbach’s answer is that we should “take the narrowest class for which we have reliable statistics. In our example, we should take the class of tubercular men of forty years of age. The narrower the class, the better the determination of the weight.”

<sup>52</sup> I.e., in which the conditional probability of A given B is defined only for cases in which the probability of B is greater than zero, in which event the probability of A given B is defined as the probability of A&B divided by the probability of B.

<sup>53</sup> A bet on H is conditional on D just where, absent the occurrence of D, a bettor neither wins when H occurs nor loses his stake when H does not occur: if D does not occur, then all bets are off and the bettor’s stake is returned to him. See for example Jeffrey (2004, section 1.4, esp. pp. 14-15). There is however another Bayesian approach which takes *conditional* probabilities as primary, construing them as (possibly objective) degrees of support – for a simplified overview of this alternative approach, see Hawthorne 2008.

<sup>54</sup> Dutch book arguments are available to show that if a person’s probability assignments are not coherent, that person will consider “fair” a set of bets such that the bookie has a net gain and the bettor suffers a net loss no matter what happens.

<sup>55</sup> Roughly, in the more usual accounts, when at a time  $t$  the probability of  $e$  goes to 1 or something close to 1, the probability of any proposition  $h$  such that the probability of  $e$  given  $h$  before  $t$  was low needs to be re-assessed and after  $t$  the proposition  $h$  should be assigned a probability equal to the conditional probability of  $h$  on  $e$  prior to  $t$  as computed by Bayes' rule.

<sup>56</sup> To my mind, there are two problems with this last phase of the story. (1): Arriving at posterior probabilities in the manner described will lead to “better” estimates of the probability of  $h$  (irrespective of the “prior” probability of  $h$  with which you originally started) only if the *likelihoods* you are using (the assumptions about the probabilities of the various possible data outcomes given the hypothesis  $h$ ) are more or less correct. (2) The second problem for any strict subjectivist has to do with what it means to say that one subjective probability is “better than” another. De Finetti, for example, rants against the idea that a probability can in any sense be (objectively) correct (see note 57 below). Inevitably, I think, Bayesians *should* be led to talk about subjective probabilities “tracking” frequencies; and though a few have done that, my impression is that most Bayesian theoreticians avoid such talk. At the more practical level, “better” probability estimates are perhaps best understood pragmatically as estimates that lead more often to correct predictions – but to take that pragmatic turn is to construe Bayesianism as in the final analysis a species of frequentism. Actually, I myself may be doing just that when I say in section 8.3 that the divisions between frequentist and Bayesian statisticians over specific statistical methods ought to be sorted out by the statisticians themselves on the relative fruitfulness of the two approaches.

<sup>57</sup> Admittedly, *some* (many?) subjectivists reject the idea that there is such a thing as “objective chance” (in de Finetti’s case, almost to the point of ridiculing it). See Hacking (1965, pp. 211-215) for an account of de Finetti’s arguments against the very idea of objective chance. Savage (1954, pp. 62-63) expresses skepticism about the prospects of what he there called objectivistic views such as Reichenbach’s (and which later, in Savage 1964, pp. 174-80, he called frequentist views), but Savage is more guarded in his remarks than de Finetti was. However, see Jeffrey (2004, section 1.8), which I take to be an attempt to make provision for handling something like objective chance within a subjectivist perspective.

<sup>58</sup> The quoted words are from Sellars (1964, p. 204). An introductory overview of that reconstruction can be found in Sellars 1970; but for the full details one must look to Sellars 1964. It is perhaps worth noting that although the account of “induction” offered in these two papers makes little *explicit* contact with Sellars 1954/1963, Sellars (1964, pp. 212ff.) continues to insist on “the view that the law-like statements which it is the object of nomological induction to establish are principles of inference and that the problem of induction cannot be solved without that insight” – a theme that was crucial Sellars 1954/1963 account of induction.

<sup>59</sup> I’m aware of only two serious attempts to deal with the views set out in Sellars 1964 and 1970. The first is a basically sympathetic treatment by Keither Lehrer in Lehrer 1973 and Lehrer 1983 – the latter paper being something of a retraction of the central criticism Lehrer had mounted in the earlier paper. The second is an unsympathetic treatment in a paper by Gilbert Harman (Harman 1975).

<sup>60</sup> See especially points (i)-(iv) on pp 5-6, as well as part III of that paper.

<sup>61</sup> See Sellars 1964, pp. 198-199, where the idea that probability must be a *relation* is criticized as a “non-sequitur.” Sellars claims that taking “probable” to be a “relation word” would be analogous to taking ‘father’ in the sentence “Tom is a father” to be a relation word. However, he is quite prepared to say that although being probable is a property and not a relation, it is like fatherhood a *relational property*. See also Sellars 1964, pp. 200-204, where Sellars discusses the relationship between “It is probable that  $p$ ” and “Evidence  $e$  makes it probable that  $p$ .”

<sup>62</sup> Sellars (1964, p. 220) says that “[it] is with statistical explanation, in a suitably broad sense, that we first encounter a metric concept of probability.” However, he explicitly discusses of only two sorts of case when he introduces metric concepts or dimensions of probability. In Part XIII, esp. paragraph 69, he discusses inferences which involve the “statistical or proportional syllogism” – reasoning in which the data contains knowledge of the proportion of A’s among B’s and the “target proposition” is a statement to the effect that a particular A is a B. And in Parts XIV-XVI he discusses inference from data concerning the relative frequency of a property B in sample of a given size drawn from a population of known size to a target proposition stating that the relative frequency of B in that population is within a small number  $\epsilon$  of its relative frequency in the sample. However, these are just two sorts of case in which numeric probability is invoked by frequentist statisticians. Sellars makes no attempt to come to grips with Bayesian approaches to statistics (which admittedly were only beginning to have an impact in 1964).

<sup>63</sup> Lehrer (1973, p. 81) has commented: “Sellars' theory of induction and rational acceptance is of fundamental philosophical importance. For he articulates a set of rules that aim at producing an overall system of accepted statements with a maximum of explanatory coherence. What is especially significant about Sellars' treatment of rational acceptance is his attempt to formulate quite specific rules for the acceptance of theories, laws, and singular statements which take account of the different epistemic purposes such statements serve within a system. . . the attempt to elaborate a set of specific rules resulting in a *system* of accepted statements promoting the goals of explanation and veracity is rare, bold, and paramount.” In the oversimplified account I'm about to offer, I make no attempt to capture the “set of specific rules” that result in such a system – and perhaps therefore I fail to bring to light the very feature that renders Sellars' theory “of fundamental philosophical importance.”

<sup>64</sup> Other key ideas are left out of my summary. For example, in Sellars' full story it is essential to recognize that there are a variety of “species” of probability – including, for example (Sellars 1970, 86), the probability of theories, the probability of law-like statements, the probability of statements of proportion, the probability of singular statements. And (n Sellars 1964) it is also essential to recognize that theoretical probability presupposes but does not reduce to the probability of law-like statements, and the latter sort of probability presupposes but does not reduce to proportional (or statistical) probability – see, for example, Sellars 1964, p. 198). Moreover, what Lehrer called the “epistemic objectives” in relation to which acceptance becomes reasonable vary from one “species” of probability statement to another. For example, the objective operative in Sellars account of the acceptance of theories is (1964, p. 209) is to accept “the simplest available framework which generates new testable law-like statements, generates acceptable approximations of nomologically probable law-like statements and generates no falsified law-like statements.”

<sup>65</sup> See Sellars 1964, p. 202: “The solution of the puzzle emerges for our account of ‘it is probable that-*p*’ as equivalent to ‘there is a good argument of one or other of certain patterns for accepting that-*p*’. According to this analysis a probability statement is ‘elliptical’ for a statement making a *general* reference both to the evidence and the relation of the evidence to the proposition that-*p*’; but the statement for which a probability statement is thus “elliptical” is not, itself, a ‘non-elliptical’ statement involving the predicate ‘probable’ in two-place glory, but simply its *analysis*.”

<sup>66</sup> Statements of this form are “conditional intentions,” and Sellars says (p. 204) that “a **general** conditional intention can be called a policy.” A fuller account of such practical reasoning would include the step in which a *policy* (i.e., general intention of the form “I shall accept a proposition if it satisfies condition *C*”) follows from an “*end-in-view*” – that is to say, the intention to achieve a state of affairs *E* such that bringing about *E* implies accepting a proposition, if it satisfies condition *C*. See p. 208.

<sup>67</sup> Indeed, he says (p. 201) “the approach to probability through the concept of non-demonstrative inference is a mistake” and suggests that to think there are non-demonstrative inferences “is, as I see it, to confuse the relation between the terminal outcome of an argument pertaining to probability and its premisses with the ground-consequence relation” (p. 202). See also all of Sellars 1970.

<sup>68</sup> To illustrate the sort of thing Sellars has in mind, let me quote Lehrer's fairly lucid, simplified account (Lehrer 1973, 89-90) of one such type of reasoning – what Sellars calls ‘proportional syllogisms’ as reconstructed in Sellars 1964, pp. 220-224:.

Sellars' account of the reasonable acceptance of singular statements, statements of the form:  $a_i$  is  $B$ , where  $a_i$  is an observable entity, is based on a goal of accepting a majority of true statements of a specified kind. The goal at this level is truth rather than explanation. Suppose we raise the question: is  $a_i B$ ? If our goal is to answer this question in such a way that a majority of our answers are correct, then, Sellars affirms, we need only ascertain that  $a_i$  is a member of some class  $K$  such that membership in  $K$  is the only relevant knowledge we have concerning the membership of  $a_i$  in  $K$ , and we know that a majority of the members of  $K$  are  $B$ . If we know that  $a_i$  is a member of such a class, then it is reasonable to accept the singular statement that  $a_i$  is  $B$ . The reasonableness of accepting each such singular statement is that by accepting all such singular statements, we shall obtain a preponderance of correct over incorrect answers to the question: is  $a_i B$ ? The latter is the goal, and such acceptance promotes it.

<sup>69</sup> “In other words to inscribe a *conclusion* is to satisfy an authorization which is not and cannot be a step in the argument. On the other hand the “conclusion,” in the sense of the terminal outcome, of a probability argument stands to the proximate outcome or conclusion proper as performance to authorization.” (Sellars 1964, p. 200)

<sup>70</sup> I take the meta-argument to be *something* like “Since there is a good argument all things considered for the conclusion “I shall accept that-p” and since a proposition is probable if there is a good (practical) argument whose conclusion authorizes the acceptance of that-p, it is probable that-p.”

<sup>71</sup> The dangers Sellars alludes to, of course, are at the heart of Kyberg’s lottery paradox, which led Kyberg to insist that the acceptability of *p* together with the acceptability of *q* does not guarantee the acceptability of *p & q*. It is the failure to recognize this fact that Kyberg branded “conjunctivitis” (Kyberg 1970).

<sup>72</sup> He says (p. 229): “To say that the acceptance of *h* is reasonable, but that it is not reasonable to act on *h*, is surely to say that whatever role *h* may play in the initial stage of deliberation, the assertion of *h* will not occur in the culminating syllogism which yields a reasonable answer the question ‘What shall I do?’ in a context in which one is confronted by the fact that *h* is ‘merely probable.’” He then illustrates his point by describing a situation in which it is allegedly reasonable to answer the question “What shall I do?” in a particular situation on the basis of a reasonable-to-accept hypothesis about which *type of action* in situations like this one will maximize expected utility *over a run of such situations, rather than* to answer it on the basis of a reasonable-to-accept hypothesis about what will happen *in this particular situation*. What is missing in the story Sellars tells here is any *principled* account of why it is *not* reasonable to answer such questions in situations like the one he describes on the basis of a reasonable-to-accept hypothesis about what will happen *in that particular situation*.

## REFERENCES

- Adler, J. (2002). *Belief's Own Ethics*. Cambridge, Mass.: MIT.
- Biro, J. and Siegel, H. (1992). Normativity, Argumentation and the epistemic theory of fallacies. In F. H. van Eemeren, et al, *Argumentation Illuminated* (Amsterdam: SICSAT).
- Brandom, R. (1994). *Making It Explicit: Reasoning, Representing and Discursive Commitment*. Cambridge, Mass.: Harvard University Press.
- Bratman, M. E. (1987). *Intentions, Plans, and Practical Reason*. Cambridge, Mass.: Harvard University Press.
- Bratman, M. E. (1999). *Faces of Intention: Selected Essays on Intention and Agency*. Cambridge: Cambridge University Press.
- Carnap, R. (1950/1962). *Logical Foundations of Probability*. Chicago: University of Chicago Press. Page references are to the second edition, published in 1962,
- Carnap, R. (1952). *The Continuum of Inductive Methods*. Chicago: University of Chicago Press.
- Cohen, L.J. (1992). *An Essay on Belief and Acceptance*. Oxford: Clarendon Press.
- De Finetti, Bruno (1937/1964). La Prévision: ses lois logiques, ses sources subjectives. *Annales de l'Institut Henri Poincaré*, pp. 1-68. English translation: Foresight: its Logical Laws, Its Subjective Sources. In H. E. Kyburg and H. E. Smokler (eds), *Studies in Subjective Probability* (New York: Wiley, 1964), pp. 93-158.
- Dretske, F. (1970) Epistemic Operators. *The Journal of Philosophy*, 67, pp. 1007-1023. Reprinted in Dretske, *Perception, Knowledge and Belief: Selected Essays* (New York, NY: Cambridge University Press, 2000), pp. 30-47.
- Dretske, F. (1981). The Pragmatic Dimension of Knowledge. *Philosophical Studies* 40, pp. 363-378. Reprinted in Dretske, *Perception, Knowledge and Belief: Selected Essays* (New York, NY: Cambridge University Press, 2000), pp. 48-63.
- Ennis, R. (2007). 'Probably'. In D. Hitchcock, & B. Verheij (Eds.), *Arguing on the Toulmin Model: New Essays in Argument Analysis and Evaluation* (pp. 145-164). Springer.
- Ennis, R. (2007b). 'Probable' and 'Probability'. In H.V. Hansen, & R.C. Pinto, *Reason Reclaimed*. Vale Press.
- Fisher, R.A. (1973). *Statistical Methods and Scientific Inference*. New York: Hafner Press.
- Goldman, Alvin (1976). Discrimination and Perceptual Knowledge. *The Journal of Philosophy* 73, pp. 771-791.
- Goldman, Alvin (1979). What is justified belief. In George Pappas, ed., *Justification and Knowledge* (Dordrecht: Reidel), pp. 1-23.
- Goldman, Alvin (1988). *Epistemology and Cognition*. Cambridge, Mass.: Harvard University Press.
- Hacking, Ian (1965). *Logic of Statistical Inference*. Cambridge and New York: Cambridge University Press.
- Hacking, Ian (1967). Possibility. *The Philosophical Review* 76, pp. 143-168.
- Hacking, Ian (1975). *The Emergence of Probability: A Philosophical Study of Early Ideas about Probability, Inductin and Statistical Inference*. New York: Cambridge University Press.



- Hacking, Ian (1990). *The Taming of Chance*. New York: Cambridge University Press.
- Hacking, Ian (2001). *An Introduction to Probability and Inductive Logic*. New York: Cambridge University Press.
- Harman, G. (1986). *Change in View: Principles of Reasoning*. Cambridge: MIT Press.
- Harman, G. (1975). Wilfrid Sellars' theory of induction. In H.-N. Casteneda (Ed.), *Action, Knowledge, and Reality: Critical Studies in Honor of Wilfrid Sellars* (pp. 265-275). Indianapolis: Bobbs-Merrill.
- Hawthorne, James (2008). Inductive Logic. *Stanford Encyclopedia of Philosophy*. URL for this article is <http://plato.stanford.edu/entries/logic-inductive/>.
- Jeffrey, Richard (2004). *Subjective Probability: The Real Thing*. Cambridge: Cambridge University Press.
- Kauffeld, Fred (2003). The Ordinary Practice of Presuming and Presumption with Special Attention to Veracity and the Burden of Proof. In F. van Eemeren et al. (eds.), *Anyone Who has a View: Theoretical Contributions to the Study of Argumentation* (Dordrecht: Kluwer), pp. 133-146.
- Kauffeld, Fred (2009). Presuming and presumption in everyday argumentation: A response to Godden and Walton. In Hansen, Tindale et al., *Proceedings of the Eight OSSA Conference: Argument Cultures* (Windsor, Ontario: OSSA. CD.).
- Kyberg, H. E. (1970). Conjunctivitis. In M. Swain (Ed.), *Induction, Acceptance and Rational Belief* (pp. 55-82). Dordrecht : Reidel.
- Lehrer, K. (1973). Reasonable Acceptance and Explanatory Coherence: Wilfrid Sellars on Induction. *Nous* , 7, 81-103.
- Lehrer, K. (1983). Sellars on Induction Reconsidered. *Nous* , 17 (3), 469-473.
- Lewis, C.I (1946). *An Analysis of Knowledge and Valuation*. La Salle, IL: Open Court.
- Moore, G. E. (1962). *Commonplace Book: 1919-1953*. London: George Allen & Unwin.
- Peirce, C. S. (1982- ). *Writings of Charles Saunders Peirce: A Chronological Edition*. Bloomington, Ind.
- Pinto, R. C. (2001). *Argument, Inference and Dialectic*. Dordrecht: Kluwer Academic Publishers.
- Pinto, R. C. (2002). Truth and Premiss Adequacy. In H. V. Hansen et al., *Argumentation and its Applications*. Windsor, ON: Ontario Society for the Study of Argumentation.
- Pinto, R. C. (2003a). Reasons. In F. van Eemeren et al. (eds.), *Anyone Who has a View: Theoretical Contributions to the Study of Argumentation* (Dordrecht: Kluwer), pp. 3-15.
- Pinto, R. C. (2003b/2009). "Note on Acceptability". An appendix to "The uses of arguments in communicative contexts." in J. A. Blair et al., *Informal Logic at 25: Proceedings of the Windsor Conference*. Windsor, ON: Ontario Society for the Study of Argumentation. A revised and enhanced version of that appendix is available at the following URL: <http://web2.uwindsor.ca/courses/philosophy/pinto/papers.htm>.
- Pinto, R. C. (2006). Evaluating inferences: the nature and function of warrants. *Informal Logic* 26, pp. 287-317. Reprinted in D. Hitchcock & B. Verheij (eds.), *Arguing on the Toulmin Model* (Springer, 2006), pp. 115-143.
- Pinto, R. C. (2009). Argumentation and the force of reasons. *Informal Logic*, XXX., pp XXX/
- Pinto, R. C., Blair, J. A., & Parr, K. E. (1993). *Reasoning: A Practical Guide for Canadian Students*. Scarborough, Ontario: Prentice Hall Canada.
- Pollock, J. L. (1995). *Cognitive Carpentry: A Blueprint for How to Build a Person*. Cambridge, MA: MIT.
- Pryor, James (2005). There is immediate justification. In Steup and Sosa, eds., *Contemporary Debates in Epistemology* (Blackwell).
- Pryor, James (2007). Reasons and that-clauses. *Philosophical Issues* 17 (2007), pp. 217-244.
- Reichenbach, Hans (1938). *Experience and Prediction*. Chicago: University of Chicago Press.
- Kauffeld, F. J. (2003). The Ordinary Practice of Presuming and Presumption with Special Attention to Veracity and the Burden of Proof. In van Eemeren, Blair, Willand and Snoekck Henkemans, eds, *Anyone Who Has a View*. Dordrecht: Kluwer.
- Savage, Leonard J. (1954). *Foundations of Statistics*. New York: John Wiley and Sons.
- Savage, Leonard J. (1964). The foundations of statistics reconsidered.. In H. E. Kyburg and H. E. Smokler (eds), *Studies in Subjective Probability* (New York: Wiley, 1964), pp. 173-188.
- Searle, J. (1969). *Speech acts : an essay in the philosophy of language* . [New York, Cambridge: Cambridge University Press.
- Searle, J. (1979). *Expression and Meaning*. Cambridge: Cambridge University Press.
- Sellars, W. (1954/1963). Some Reflections on Language Games. *Philosophy of Science* 21, pp. 204-228. Reprinted in W. Sellars, *Science, Perception and Reality* (London: Routledge and Kegan Paul, 1963).
- Sellars, W. (1964). Induction as vindication. *Philosophy of Science* , 31, 197-231.

- Sellars, W. (1970). Are There Non-Deductive Logics ? In N. Rescher *et al.* (eds.), *Essays in Honor of Carl G. Hempel* (pp. 83-103). Dordrecht: Reidel.
- Toulmin, S. (2003/1958). *The Uses of Argument, Updated edition*. Cambridge: Cambridge University Press.
- Toulmin, S., Rieke, R., & Janik, A. (1984/1979 ). *An Introduction to Reasoning, Second Edition* (second ed.). New York: Macmillan.
- Ullmann-Margalit, E. (1983). On Presumption. *Journal of Philosophy* , 83 (3), 143-16.
- Vaidya, Anand (2007). The epistemology of modality. An entry in the *Stanford Encyclopedia of Philosophy*, located at <http://plato.stanford.edu/entries/modality-epistemology/>.