
On Rough Ground: Knowledge and Uncertainty.

Introduction

Jose Ortega y Gasset (1885–1955), the great Spanish philosopher, was initially a student of the phenomenological school in philosophy.¹ One of the procedures of the phenomenological method as originally formulated is bracketing, where one deliberately sets aside ways in which something is familiar, in order to attend to what is presented in experience, free of all the boxes one might have put it that might have obscured aspects of its reality.² Whatever the value of that exercise as a critical tool might be, Ortega finally said that philosophy has to be about life, and that “life is fired at us point-blank” all around — and there’s no way to bracket that.³

Back to the Rough Ground: Phronesis and Techne in Modern Philosophy and in Aristotle is the title of a book by philosopher Joseph Dunne.⁴ “Rough ground” refers to the life in the real world Ortega said philosophy needs to be concerned with. It’s a useful metaphor for the realms of experience that won’t sit still long enough to be bracketed, and refuse to be contained by uniform systems of abstract thinking. Recall the Argentine writer Jorge Luis Borges’ famous story, “Of Exactitude in Science” in which a group of cartographers sets out to make a map which corresponds to the world exactly, in scale and detail.⁵ The tale can be read to suggest the absurdity of such an attempt as a perfect science which could capture the wide world of human life, which changes faster than we can catalogue and control it. The ground is rough in many ways, and maps can only be general guides.

Still, guides are useful. As we said in the Introduction to the Project, our broader goal in these papers is to make a map of contemporary risk management, seen in philosophical perspective. In this paper, however, we want to focus on the backdrop of that activity, borrowing Dunne’s phrase, “rough ground”, to describe the field with which risk management seeks to cope. The rough ground, then, is not identical to the landscape depicted in our map but is, instead, broader — the whole world of human endeavor. Far from ignoring Borges’ lesson, our treatment will underscore the challenges the rough ground presents to attempts to represent and manage it. After having a look at some of these difficulties, we’ll turn briefly to examine calculative methods of coping with them. This will require introducing a lot of philosophical topics in all too brief a space. We’ve tried to make up for the sketchy presentation by providing plenty of bibliographical material for further research. After making a case for the priority of intuitive practical judgment, we’ll move on to Paper Three where we’ll outline a classical prudential approach to navigating uncertain terrain.

¹ Phenomenology was initiated by Franz Brentano (1838–1917), but really gets going with his student Edmund Husserl (1859-1938) with whom it is most associated.

² On bracketing (a translation of the Greek, *epoche*—abstention), see Husserl’s *Ideas: General Introduction to Pure Phenomenology* W. R. Boyce Gibson, trans. (New York; Collier, 1962.) sections 31–36.

³ *The Mission of the University*, 1944. Many editions. See also Pedro Blas Gonzalez’ *Human Existence as Radical Reality: Jose Ortega y Gasset’s Philosophy of Subjectivity*, St. Paul, MN: Paragon House, 2005.

⁴ (Notre Dame: University of Notre Dame Press, 1997).

⁵ *A Universal History of Infamy*, Norman Thomas de Giovanni, trans. (New York: Penguin, 1975). Lewis Carroll may be the originator of the conceit of a perfect map; see his *Sylvia and Bruno Concluded*

I. The Rough Ground

Like politics or any other field of human affairs, business deals largely with contingent states of affairs. The contingent is what might have been otherwise; what does not occur or obtain with necessity.⁶ In theory, perfect knowledge would be of states of affairs that are necessary⁷, that is, could not be otherwise, whether or not one thinks knowledge of that type attainable.

Most of the ancient Greek philosophers thought that one could have wholly certain knowledge of only a very small range of reality comprising mathematical truths and certain fundamental principles of being. It was typically thought that the grounds for our knowledge of such truths were not derived from sensory investigation. The rest was rough ground: knowable in part — it is, after all, ground — but uneven and irregular, unlike a geometric line or plane. Our cognitive dealings with it are, then, experimental, susceptible to surprise, and involve risk.

Both the innumerable quantity of the factors which go into making the events of our daily experience, and their contingent character, means that our grasp of them must be “for practical purposes,” as the saying goes. Usually, the most we can know of this multifaceted reality is enough to reasonably make a move. About it we can achieve only practical certitude. According to Aristotle, experience sifts from the vast array of data something like fairly consistent patterns, and these can, presuming well-adjusted, thoughtful, and reasonably fortunate person, be in large measure relied on as a basis for comparison when dealing with events.

Human beings are constantly pursuing goods, and the forum of this activity, lived life, can be pictured as a landscape within which we move. The big goods, whether personal or collective, form the horizon that is one’s final destination. It is in reference to this horizon that the landscape and its features take on significance as points along the way. Nearer objects (that may be goods in themselves) can be means toward a more comprehensive goal, pictured as the horizon. And it is here that we can profitably explore further the metaphor “rough ground”.

What specific features lead us to call the landscape of human action rough? First, it very rarely presents an uninterrupted line of vision. Even necessary and useful things may loom large and near, obscuring aspects of the horizon even while pointing the way to it: everyone has had the experience of losing the forest for the trees. Landmarks that may normally serve as guides on our itinerary may engage us in such a way that we run the risk of losing our orientation in some measure. We also encounter outright obstructions calling for ad hoc ingenuity and the use of equipment we’ve packed in, if we are to regain our bearings.

This aspect of the metaphor might be referred to as the problem of the line of sight. A surveyor can plot a course based on information he can get from well-chosen vantage-points. Sometimes those vantage points are the tops of things originally encountered as obstacles. But even the clever surveyor has to deal with the fact that once back on the march, things as originally seen may change: a wood might burn down the day after coming into view; snow may cover familiar landmarks and so on. Because the path can change drastically without warning; there is no way to predict it with perfect reliability. The surveyor must be ready to revise his projected route, and to reread the terrain from new vantage points.

Consider, for example, a company that plans to build a factory in another country. After thorough investigation it concludes that the country’s laws and their

⁶Along with actual, contingent and necessary are “modal” modifiers. We can think of modes as 1) ways for *matters* to be the case or not, or 2) ways for *propositions* about matters to be true or false. The first is modality predicated of things (*de re* modality); the second is modality predicated of propositions or claims (*de dicto* modality). We can characterize modes without choosing between *de re* or *de dicto* predication in the following way:

If so-and-so can be the case, it is possible.

If so-and-so is the case, it is possible and actual;

If so-and-so must be the case (could not fail to be the case), it is possible, actual, and necessary.

If so-and-so could not be the case, (could not have actual) it is impossible, and not actual.

Note that these modal adjectives have nothing to do with our knowledge or uncertainty about what is the case or not, as when we say “Possibly she is home, I’m not really sure” or “It’s impossible that she’s home, I’ve knocked for half an hour.”

On our usage, *probability* will be the likelihood of some possible event becoming actual, or of some possibly true statement becoming true. The probable will then be a subset of the possible.

⁷ Or, if you prefer, propositions that are necessarily true.

enforcement are sufficient to make it reasonably secure. The plans proceed until nearly completed, when a coup interposes, radically altering the legal and political environment. If the company wishes to proceed, it will have to markedly adjust or even drastically change its course of action, especially its methods of gathering information about the political milieu.

The second problem is the problem of footing. The ground underfoot has many small features that foresight, which is more telescopic and fitted for a longer-range view, doesn't detect very well. This ground is neither perfectly flat nor even. It is irregular, and we take this for granted. This irregularity presents innumerable small but important departures from the tacitly expected. And so we have to make constant adjustments in everyday action. On trash-day while driving to an important meeting, we may be making deft adjustments to avoid city workers and errant trash-cans, only to run over a nail that flattens a tire.

These two extrapolations of the rough-ground metaphor capture long-range and short-range aspects of the same character of "roughness," the variability that eludes perfect prediction and uniform handling. But also, knowing is always a personal act; we have desires, expectations, and feelings which arise in response to our experience, and cause attraction or aversion. These sorts of impulses not only act as a screen through which our perception of the world is filtered; they can also conflict with each other. Thus the psycho-emotional aspects of our responses to objects of perception also contributes to unevenness: not only are we on rough ground; but our own feet often seem to want to move in unreliable ways. This third liability is the problem of personal response.

To attempt to actively foresee each of even just that set of possibilities that would prove *most* problematic would result in paralysis. Prolonged assessment means logging less miles toward our goals.⁸ Indeed, as Soren Kierkegaard saw clearly, reflection may be used to *evade* reality. Still, these possibilities may become actual and trip us up, even disable us. They must, then, be anticipated and prepared for *in some sense and in some way*. We have to expect and ready ourselves for the unknown, without halting our advance. This will mean developing skills ahead of time — as well as *en route* — which we can exercise as situations present themselves.

In addition to its unwieldy bulk, the *kinds* of information relevant to human projects are bewildering in their variety, calling for a number of different disciplines and their specific tools for selecting, gathering, and interpreting data. Call this fourth problem *the problem of multi-disciplinarity*. Making our way through rough country may require expertise in astronomy for navigation, in herbology for treating wounds, and in woodcraft for improvising suitable tools. Leaving the metaphor aside, the information relevant to a given risk policy regarding nuclear facilities may include atomic, meteorological, and sociological data. Decisions about the responsible use of fertilizer in coastal farms may involve research into crop yields, erosion patterns, salmon migration, ocean temperatures, and killer whale populations. And so on. Marshaling such expertise is of course costly in terms of time and energy, making it, in turn, a candidate for cost-benefit analysis. And so may loom another regress of analysis.

Of the disciplines mentioned above, sociology deserves special attention here for the particular problems posed by its subject matter, human action in — or influenced by — a social setting. (We might mention also psychology.) The problem of human action arises due to the resistance of human behavior to explanations that would enable us predict it.⁹ Indeed, resistance will seem to weak a word to some: a number of philosophers would object from the outset that humans are free agents, and that this militates against the notion that human behavior is predictable.¹⁰ Others are ready to apply a deterministic outlook across the board and deny libertarian freedom. The more empirically-minded will simply go out and observe whether human behavior is or not predictable by gathering data about situations, beliefs, desires, and actions.¹¹ In any case, if, in principle, human behavior can be predicted, then doing so would be of great interest to risk managers since a good deal of risk is produced not only as the unintended by-product of human choice but as its explicit aim. But we are long way off from a science that predicts human behavior. It appears that the best we can do for the foreseeable future (!) is to formulate rules of thumb, conditional projections from current trends, and partial explanations of behavior after the fact.¹²

⁸ See his *The Modern Age* Howard V. Hong and Edna H. Hong, trans. (Princeton, NJ: Princeton UP, 1978), especially the translators' introduction on Kierkegaard's use of the Danish term *Reflexion*.

⁹ On the ability of the social sciences to explain and predict human behavior, see Jon Elster, *Explaining Social Behavior: More Nuts and Bolts for the Social Sciences* (Cambridge, Cambridge UP, 2007) chapters 1–3.

¹⁰ On the philosophical debate about free agency and determinism, see the papers in *Free Will*, Gary Watson, ed. (Oxford: Oxford UP: 1982).

¹¹ These may even be inclined toward a strong doctrine of human freedom, while maintaining that *as a contingent* fact, humans exhibit certain patterns of decision (arguing that it doesn't follow from freedom that behavior is unpredictable).

¹² These have well-known dangers in the form of racial profiling, class-bias, and so forth.

This raises a sixth problem, the problem of reflexivity, which complicates matters further. As we disseminate information and theories about the rough terrain, we are liable to change that terrain. Here observation alters the thing observed, though in a fairly straightforward way. Reflexivity pertains firstly to human agents: as we learn about our beliefs, desires, and actions, we adjust our beliefs, desires, and actions. Projecting the habits of groups based on recent behavior may help falsify those projections, as pollsters in Vermont know well. Ironically, reasonable projections may help create the conditions of their own falsehood. As Anthony Giddens has highlighted, modernity's dynamism is triggered precisely by attempts, especially by sociologists, to describe it.¹³

Other complications might be listed, but these give us enough to lay out important coordinates for covering our topic. In Paper Three we'll outline a classical strategy for dealing with them, one that has lately begun to be rediscovered: creative foresight and skilled readiness, or *prudentia*. This approach frames the matter not as a question of having mastered the calculation of numerically represented probabilities, useful as this can be. Instead it underscores the importance of the working-knowledge of individuals attuned to relevant cues in the environment, along with the ethical disposition to adjust their paths toward the horizon in light of them. Prudence is firstly skilled know-how rather than knowing-that.

Of course, people have always sought ways to flatten the terrain as much as possible — to make it more cognitively manageable. The use of mathematics as a tool of figuration is the preeminent method of doing so, since it allows for a conversion of things difficult to know into a form that makes them — or aspects of them — easier to know. Modernity's experimental methods and the tools of rigorous quantification have had their most spectacular predictive success in the field of the natural sciences which proceed on the assumption, typically, that the universe operates in law-like ways.

But scenarios truly amenable to complete quantification and prediction are few, even if some still hold out hope that science will someday render all things predictable with full certainty. Few philosophers, and fewer scientists still entertain this ambition.¹⁴ A thorough consideration of the matter would take us too far from our aim here, but for now we can say with Ortega that human affairs don't wait for the answers to such questions. In any case, the desire for tools with which to flatten the ground has led to "physics envy." Here practitioners of the so-called "soft-sciences" — sciences like sociology and economics that deal with phenomena less fitted to exhaustive mathematical representation — aspire to make their disciplines as rigorous, certain, and predictive as mathematical physics.¹⁵ The same desire for reliable methods of control has made its mark in everyday fields in the form of technical notions of professions and disciplines, as well as in the drive toward a "science" of the political, with mixed results for practice.¹⁶

Arguably, from prediction one can increase *works*, or utility, as Francis Bacon urged us to do at the outset of the scientific revolution.¹⁷ We will turn shortly to the question of the predictive value and usefulness of calculative approaches to risky terrain. But many species of calculative approach are still highly attractive to politicians and business people. In fact it is fair to say that in the theory of risk management such approaches dominate the field to the exclusion of others, though perhaps this is not the case in the actual practice of many risk managers. One reason this may be so is that probability has so far proved easier to theorize (no mean feat, however¹⁸), or far more tempting to theorize, than has human know-how.

II. Means of Dealing with Rough Ground: Practical Reasoning, Probabilistic Reasoning.

In paper one we introduced prudence as a means of dealing with uncertain, risky scenarios — like life itself. We saw that Aristotle's notion of prudence involves deliberation (*eubolia*) and that on one reading, deliberation means explicitly reasoning things through — considering what we're after, various options

¹³ Anthony Giddens, *Modernity and Self-Identity: Self and Society in the Late Modern Age* (Stanford: Stanford UP, 1991) 20; *The Consequences of Modernity* (Stanford: Stanford UP, 1990) 36ff.

¹⁴ On the picture of prediction emerging from indeterminacy in physics see Nicholas Rescher, *Luck: The Brilliant Randomness of Everyday Life*, (New York: Farrar Strauss Giroux: 1995) 42–46. In a nutshell, quantum indeterminacy entails that from the same initial conditions, different outcomes are possible. This renders the in-principle predictability of physical states (even if *our* ignorance made them unpredictable in practice) taught by earlier deterministic physics obsolete. In the quantum picture certain atomic states are such that predicting is impossible, in principle, because of their nature, not ours. Ironically, we can still make *reasonable* predictions about those future states based on statistical frequencies.

¹⁵ On the attempt of economics to model itself after physics, see Stephen Toulmin, *Return to Reason* (Cambridge, MA: Harvard UP, 2001), especially the fourth chapter, "Economics, or the Physics that Never Was".

¹⁶ On professions, see Donald Schon, *The Reflective Practitioner: How Professionals Think in Action* (New York: Basic Books, 1983). On disciplines, see Stephen Toulmin, *Return to Reason* (Cambridge, MA: Harvard University Press, 2001). For a treatment of the rise of a notion of a science of politics, see Isaiah Berlin's 1957 essay, "Political Judgment," reprinted in *The Sense of Reality* (New York: Farrar Strauss Giroux, 1996).

¹⁷ *Novum Organum*, Peter Urbach and John Gibson, eds. (Chicago: Open Court: 1994).

¹⁸ On the history of the concept of probability and the development of methods for calculating it, see Ian Hacking, *The Emergence of Probability: A Philosophical Study of Early Ideas about Probability, Induction and Statistical Inference* (Cambridge, UK: Cambridge University Press, 1975, 2006).

for obtaining it, and drawing conclusions. This is practical reasoning. Another reading of Aristotle has it that deliberation is a much less conceptualized, articulated affair, but that in engaging in it, we are still responding intelligently to information in light of our goals and adjusting out actions accordingly. Unless otherwise noted, we will be using “deliberation” and “practical reasoning” to refer to the more formal, thematized process of practical argument.

An example would be my working through the following argument in my head:

- I want to be healthy
- Going to the doctor would make me healthy
- Therefore, I should go to the doctor

However, we’ll use “practical intelligence” and “practical reason” to stand for a broader capacity to reasonably address questions about what to do.

Either way, roughly speaking, practical reasoning is reasoning about what to do, what action to take in light of some goal. *Theoretical* reason, on the other hand is reasoning about what is the case or not; put in terms of truth, it is reasoning about the truth or falsehood of propositions.¹⁹ For instance: a statesman might have an excellent theoretical grasp of the causes of war, based on his knowledge of sociology, economics, and psychology; but whether or not to declare war in a particular scenario is a question of practical reason which his theoretical grasp can inform, but not decide.

As in the statesman’s case, practical reason often relies on the conclusions of theoretical reason, especially conclusions about probabilities. In deliberating about the best course of action for reaching a given goal, we may consider what the probabilities of various events are given certain evidence. Whether to climb Mt. Whitney in October is a practical question of practical reason whose answer may be better decided with the help of theoretical reason — e.g., estimating the probability of precipitation by considering past levels of precipitation this time of year, the speed of the storm blowing in from Alaska, and so on. Likewise, decisions about whether to go to war may involve propositions about the likelihood of winning based on any number of other propositions.

Some reasoning about probabilities is *deductive* — a matter of reasoning in the style of logic or mathematics. If formed correctly, deductive arguments have conclusions that follow strictly from their premises. Such arguments are *valid*. To affirm the premises while denying the conclusion of a valid deductive argument is to affirm a contradiction. If I know the number of sides of a die (six), it follows of necessity that the odds of rolling a 6 — on a fair roll²⁰ — are one in six. And, by a law of numerical probability, the odds of rolling a 1 or a 2 are two in six (=one in three).

Most of our practical reasoning with probabilities about what goes on in the physical world, however, relies heavily on *inductive* inferences (like our reasoning above about the weather on Mt. Whitney). In inductive reasoning premises support conclusions only with more or less probability: it is not the case that if the premises are true then the conclusions follow of necessity. Nor would we contradict ourselves in affirming the premises and denying the conclusion. To take a tired example: suppose all ravens found up to now have been black; probably, then, the next raven found will be black. But it needn’t be black, so far as we know. The next one could be white.²¹

¹⁹ But the distinction may be only rough; arguably, as one is reasoning about what to do, one is also reasoning about what to believe about what one ought to do. I may reason theoretically about whether or not theories of entanglement in physics are true. Or I may reason practically about whether or not to spend my time researching entanglement theories. In the second case, I am reasoning about whether to perform certain actions. But I am also reasoning about whether it is true that I should perform some actions (in order to reach my goal of, say, impressing my friends with esoteric scientific knowledge.) So we may need to say further that practical reasoning is distinguished from theoretical reasoning by its having as the content of the proposition to be believed or not something about actions to take or not. The object of inquiry here is the truth or falsity of the proposition: I should do *A*.¹⁶

But then, theoretical reason, too, will include reasoning about what to *do* —about what to believe, and so will encroach into the territory of practical reasoning. Assuming, that it is, that believing is a kind of doing. Perhaps, then, the difference is this: we reason theoretically about what do with respect to believing (Believe *x* or *y*?); but whatever our conclusion, it is not a matter of the will that we then act in conformity with that conclusion for, it seems, belief is not a candidate for voluntary action. Practical reasoning, on the other hand is deliberation about what to do voluntarily.

²⁰ Whether there is such a thing in the actual world is a good question. Deciding whether a pair of die are perfectly balanced would require empirical testing and *inductive* reasoning.

²¹ Note that this would deductively disprove that all ravens are black, for consider the following argument: Premise 1) if all ravens are black, the next will be black; Premise 2) the next raven is not black; Conclusion: Not all ravens are black. This is a valid deductive argument of the form *modus tollens*: If *p* then *q*; Not *q*; Therefore, not *P*. Much of scientific theory-testing works with this method of disproof. See Carl Hempel, *Philosophy of Natural Science* (Englewood Cliffs: New Jersey: Prentice-Hall, 1966).

Inductive arguments often take the form of generalizing about the whole population of *x*’s from a sample of them. But inductive arguments can go from sample to sample, or from whole to sample. All of these are instances of enumerative induction.

To put the argument more formally:

- All observed ravens (suppose its a very large number) have been black.

Therefore:

- The next raven observed will be black.

One should understand this argument such that the observational premise about the sample makes probable the conclusion but does not necessitate it. One could just as well state the conclusion, then, as:

- Probably, the next raven observed will be black.²²

The raven argument is an instance of basic *enumerative* induction, in which we generalize from a sample to a whole population. In daily life, we perhaps rarely articulate such arguments though we act, as it were, in accordance with them. We observe many and only black ravens; we then simply expect them. In doing so, we act as though we were directing our beliefs in accordance with another: that the future will be like the past. We may call this a working “assumption”, so long as we understand that this does not imply any explicit belief but names instead a *practice* of forming beliefs based on the past experience.²³ A further point: it seems that central to our practice of induction is good judgment in recognizing or responding to similarities. This judgment may be inarticulate, unanalyzable, but it is nonetheless receptive and responsive to the information environment. To make reliable generalizations, one must be able to recognize *relevant* similarities between past and present cases, adjust for minor differences, and form the appropriate expectations. We may have seen many and only black crows, and we may have only seen them eating from trash cans; but should we conclude that all crows eat from trash cans?

Inductive reasoning takes other forms than simple enumeration²⁴, and can become much more complex than this. What this sample argument illustrates, however, is the risky nature of *all* inductive arguments.²⁵ In making them, the degree of our subjective certainty of our belief should be a function of the *probability* of the conclusion (indeed, on one theory our certainty and the probability just *are* the same thing). And to the extent that our actions are based on beliefs derived from practical reasoning that employs premises inductively obtained, there is likelihood of our actions going astray. I may go up Mt. Whitney with a well-reasoned level of confidence in the weather remaining clement and still die in a blizzard. On the other hand, on another day, without having reasoned that the chance of precipitation was about 20% based on averages from the past, I may have stayed home and missed a full moon over fall aspens.

This might be a good place to say few words about levels of certainty about propositions for action under uncertainty. We’ve been saying just now that our level of certainty about some belief arrived at by inductive reasoning should depend on the probability of the conclusion given the premises. Though difficult to characterize precisely, the notion of certainty has to do with how firmly we believe something; we hold our *beliefs* with more or less certainty. How firmly we hold them, *subjective certainty* (or *personal probability*), comes in degrees. I may be very certain that the good weather will hold based on past observation or I may not be so sure that it will. I may even be willing to assign, somewhat arbitrarily but with some point, a numerical rating to my certainty about the weather. And my belief may be so certain that I am willing to put life and limb at risk. Note that beliefs here are not the *content* of our beliefs — e.g., that we’ll see the full moon over fall aspens — but the *acts of assenting* to such propositions — i.e., *believing* that we’ll see the full moon over aspens. Now the firmness of our beliefs doesn’t appear to be a feature of them that we have much direct control over. Its not the kind of thing we can work up or adjust voluntarily in any direct way. We see the evidence, perhaps do some calculating, and arrive at belief of more or less certainty. We may waiver in our certainty as we reconsider the evidence, our reasoning, and so on, but as with our assent itself, the firmness of our assent looks like a function of something outside of the will.²⁶

²² Though this may seem to contradict first premise.

²³ On casting the theory of knowledge (epistemology) in terms of our practices of belief-formation and their reasonableness, see William Alston, “A ‘Doxastic Practice’ Approach to Epistemology” in *Knowledge and Skepticism*, ed. M. Clay and Keith Lehrer (Boulder: Westview, 1989). On the practice of induction in particular, see Alvin Plantinga, *Warrant and Proper Function* (New York: Oxford, 1993).

²⁴ Another prominent type is *inference to best explanation* (also known as *abduction*, a term coined by C.S. Pierce, and as *hypothetical induction*). Its basic form is: 1. O is the case 2. If E is the case, then we would expect O to be the case. 3. Therefore, probably E is the case. Here E is an *explanation* of the thing observed, O. Such arguments can be run using Bayes’ rule of probability.

²⁵ This is not an inductively derived proposition about inductive arguments.

²⁶ On whether belief is under voluntary control, the classic treatment is William Alston’s “The Deontological Conception of Epistemic Justification” in James Tomberlin, ed., *Philosophical Perspectives*, 2 (Atascadero, CA: Ridgeview, 1988. For further thoughts, see Alston’s, *Beyond Justification: Dimensions of Epistemic Evaluation* (Ithaca, New York: Cornell UP, 2005) chapter 4.

Belief has some near cousins worth meeting²⁷, and mistaking these for belief may lead us to think that certainty of belief is voluntary. One of them is supposing, the mental act of holding some scenario, say the moon over Aspens on Mt. Whitney in October, before one's consciousness. Unlike belief, supposing does appear to be under our voluntary control. Likewise the attitude of committing ourselves to some proposition, or committing ourselves to act as though we believed it true. There may be times at which we are practically justified in committing ourselves to some proposition about what we ought to do, or about our odds of achieving our aim, even where we the we don't have very good grounds for believing that from the point of view of simply getting at the truth cognitively. Supposing, too, is a voluntary action with respect to the relevant proposition which may also aid us in either bringing about its truth (where our attitude is a causal factor) or in determining whether its true. Take making-true first: in certain situations calling for action, we may be doing what's best by supposing some proposition about what to do is true, in order to help us bring about its truth. In doing so, we will typically be repeating the proposition to ourselves, imagining the state of affairs to which it refers, drawing out its implications, and so on.

For example, suppose I reason rightly that I ought to have an operation with a 60% success rate so far. I know there is some risk that the decision won't secure my health. But in order to minimize that risk, it's probably a bad idea to remind myself of that 60% figure. Indeed, it would be reasonable for me to suppose that in my case the odds are better and to commit myself to that proposition, for these actions may make it so.²⁸ As for discerning the truth or falsity of some proposition, committing oneself to, say, a scientific hypothesis, may be motivationally crucial in developing a research program to confirm or dis-confirm that proposition. Of course, without an equal commitment to intellectual honesty, such a commitment may lead researchers down blind alleys.

Let's return to the main discussion of practical reasoning and probabilities. In reasoning practically about what to do concerning a given risk, we may proceed many as risk assessors do by employing quantitative reasoning regarding the likelihood of the event and the value (utility or dis-utility) of its effects: risk = probability of event x utility of event, where the variables are given numeric values. The use of these quantitative formulas can lend the impression that our conclusions about the probability of events enjoy the certainty of mathematics or of "hard" science. But of course we have to ask about how we arrived at the value for the probability slot. The conclusions of probability arguments are only certain when we are dealing with decision under risk — as with fair roles of a dice. And then what we know certainly is, in a sense, just what level of uncertainty we have about the outcome of such throw. We know certainly (assuming the throw is fair) that there is 1 in 6 chances of throwing a 3. We don't know with certainty what number will in fact be thrown.

Decision under uncertainty is another matter, and it is far more typically the case with decision about risk that we are working with *estimations* of odds rather than with strict mathematical calculations of them. Plugging chancy numbers into a calculus won't eliminate their chanciness. To repeat, risk assessment is usually two-pronged: assign-

ing a probability to an uncertain event and assessing the expected utility (or dis-utility) of that event's occurrence. "Risk" is then calculated as the probability times the (dis)utility.²⁹ Very roughly, utility is the good or harm resulting from an event. Moral philosophers would have a lot to say about the very notion of utility, for instance whether value is reducible to just one kind, if it can be measured or estimated, and on the equity of its social distribution.³⁰ There are pressing questions here about the relation of a risk's acceptability to whether it is undertaken by or imposed on those who are its subjects. Such considerations put into doubt the adequacy of consequentialist ethics³¹ that underly most modern risk management. These are important matters; unfortunately we'll have to leave them aside to concentrate on probability.

Probability is estimated in two basic ways. The first is to generalize based on past frequencies, as with our earlier case of ravens. Where we are inductively inferring from premises about the past frequencies of events, as we often do in decision under uncertainty, we proceed on the assumption of the relevant similarity of past and future cases. Though this a move that works much of the time, it can obviously go wrong. In many cases of importance to risk management — weather, for instance — it is highly problematic, especially given the possibility of long-term climatic cycles whose scale is well beyond that of

²⁷ In the family of "propositional attitudes," as they have come to be called by philosophers. Other members include wishing, hoping, wondering, doubting, etc.

²⁸ These reflections owe a lot to William James's *The Will to Believe* (New York: Dover, 1956) as well as to William Alston, *ibid*.

²⁹ "Modern risk analysis is largely based on a quantitative methodology that is, from a decision- theoretical point of view, essentially an application of expected utility maximization" (or expected disutility maximization)." Sven Ove Hansson, "Risk and Ethics: Three Approaches" in *Risk : Philosophical Perspectives* Tim Lewens, ed. (Oxon: Routledge, 2007) p. 27.

³⁰ On this, see papers 1–4 and 11 of *Risk: Philosophical Perspectives*, *ibid*.

³¹ Consequentialism in ethics is the view that...

our frequency data, as well as the possibility of fundamental climate change, due to human activity, since the bulk of our data collection was completed. What was an outlier ten years ago, based say on a hundred years of data collection, may be much more probable today. In fact, due to limitations on marshaling information (not to mention the reality of pure chance), estimations of probabilities of catastrophic events are, in general, extremely imprecise. As Shrader-Frechette underscores, they “typically vary from two to six orders of magnitude.”³² This means, for instance, that given a typical estimation of a one in a thousand chance of fatality, there may actually be a chance of one in ten; or one in ten million.

Where we simply lack robust frequency data — which is very often the case in risk profiling³³ — we rely on subjective probabilities. Ideally, these will be hunches based on long, wide experience in the relevant information environment. An experienced, observant wilderness guide may respond to wind direction, temperature, air -moisture content, the activity of animals, and so on, to conclude that it is more likely to rain than not tonight. Will the content of her belief take numerical form? Since we’ve said that certainty comes in degrees (we may be more or less certain about something), will she be willing to assign a number to her certainty? Perhaps. She may be comfortable articulating her suspicion of rain by assigning a probability—say, sixty percent, though not seventy.³⁴ Or she may be willing to go as far as assigning a ninety percent probability. And she may be reasonable in doing so. Subjectivity does not rule out reasonableness. But again, we ought not conclude from the resulting quantitative form that we are dealing with the level of certainty that comes with pure mathematics. For we are dealing not with dice (known fair) where we know the probabilities at the outset, but with something far more akin to horses at the track. What our guide has tried to express numerically is her sense of a situation that is unique, though it shares features with scenarios she has experienced before. Her reasoning about that situation may depend in part on deductive reasoning, but it will only be as strong as its weakest links — the inductive steps. Further, there is no easy way to give a numerical value to our certainty about some proposition. Indeed, one may wonder if there is a quantitative matter of fact about our certainty to express numerically, or if there is such a thing at a time, how stable it is.

Overwhelmingly, risk analysis depends on sensory observation of contingent facts, from which we infer claims about the way things will be in the future. It is thus an empirical, inductive affair. In light of all its successes, it is easy to forget that empirical science is a human discipline relying on basic judgments and fundamental strategies of knowledge-seeking whose credentials are less indubitable than many find those of mathematics to be. But though these moves are not indubitably self-evident, nor justified by deductive inference from other certain propositions, that alone does not make them illicit. For any foundational moves would themselves be either warranted in themselves or in need of warrant from other sources. Short of a regress, we need to say that some moves are basic.

This is true not just for the legitimacy (justification or warrant) of our reasoning, etc. but also for the matter of getting our reasoning going at all: if we conceive of moves as following procedural rules (attend only to evidence of type a), and add that applying a rule requires following another rule pertaining to the application of the first rule, then we’ll be caught in a regress of rules, and our reasoning will never go forward (though in a sense it may go backward). Practice will be prior to theory, truth-conducive moves to rules for finding truth. This doesn’t imply that our practices may not be refined through reflection or tutored through the use of rules thus formulated. But that reflection and rule-formation will itself rely on basic practices.

What kinds of moves will be basic in reasoning about rough ground? Selecting salient information, seeing that an inference form is valid, leaping to conjecture in trying to explain phenomena, recognizing that one situation is like another in an important respect (recognizing relevant similarity), ferreting out logical implications, devising testing methods, etc. Doing these things well requires what we call good judgment. Performing even a simple mathematical calculation requires the ability simply to see (without ruling out the possibility that one had to be taught to see) what the situation calls for.

Judgment, we’re claiming, will figure into any calculation we do, and those calculations will thus enjoy no more certainty than do the judgments on which they depend. This by no means implies that we can dispense with calculation and rely exclusively on experienced intuition. But it does put into perspective the

³² Risk and Rationality: Philosophical Foundations for Populist Reform (Berkeley: University of California Press: 1991) 81.

³³ See Schrader-Frechette, *ibid.*

³⁴ On eliciting subjective or “personal” probabilities, see chapter 13 of Ian Hacking, *An Introduction to Probability and Inductive Logic*, (Cambridge: Cambridge UP, 2001).

role of basic intuitive moves, of knowing how to go on, as Ludwig Wittgenstein would say. These are procedurally foundational to quantitative risk analysis. And in light of the difficulties of on the spot coping with changing, uncertain circumstance, we will need to depend on them extensively.

Some recent studies in cognitive psychology claim to show that people are not naturally very good at reasoning with even fairly simple probabilities.³⁵ The evidence is suggestive. And the more complex the situation, the less effective our skills. On the face of it, these studies have some force; but they require careful interpretation, and have been challenged as to precisely what it is they show. It is probably fair to say that we have evidence that people aren't very good at doing probability calculus, etc. [fill in], but that's a different thing from showing that people's practical reason tends to perform poorly in environments of uncertainty. It is also not always clear in the tests just what would constitute a competent performance, nor is it clear that the subjects know precisely what task they are to perform. Still, in some environments, expert intuition does often do fairly poorly compared to calculative methods. Our insistence on the need for expert intuition in no way militates against testing, refining and supplementing that intuition with whatever methods are available and cost-effective. Nevertheless it will be a case-by-case affair, and on-the-spot good judgment will be necessary in order to assess and deploy any supplementary practices.

Conclusion

We've tried to point up the difficulties presented for knowledge by the natural and human worlds that together we've called rough ground. Pursuing our goals there will call for diligence and keen observation, including scientific measurement and reason. As tools to be taken up by practical reason, calculative approaches are called for when available. They are allies of prudence. But they themselves require prudence in order to be deployed. We turn now, then, to explore the features of prudence as the fundamental approach to coping with wild, uncertain country.

Terms

Theoretical reason: the capacity to reason about what to believe, about what is true.

Proposition: roughly an item expressed in statements of the form S is P, where p is a property predicated of the subject S. Example: "The weather is fine" expresses the proposition that the weather is fine. Propositions are candidates for truth-values: they can be true or false.

Practical reason: the capacity to reason about what to do.

Practical syllogism: a practical argument composed of premises and a conclusion whose content concerns action.

Example:

- If I want to be healthy, I should avoid smoking.
- I want to be healthy.
- Therefore: I should avoid smoking.

Notice the form of this argument is deductive (If p then q; P; Therefore q.) but since it presumably relies for its first premise on inductive arguments about observed correlation between smoking and bad health, its conclusion only probable—only as probable as that premise. The

Inductive reasoning: a kind of reasoning which begins with premises and infers from them conclusions which are more or less probable, if the premises are true. The premises support but do not entail the conclusion. A form of probabilistic reasoning.

Deductive reasoning: a form of reasoning beginning with premises and inferring from them a conclusion which follows necessarily from them. The premises entail or imply the conclusion such that it would be a contradiction to affirm the premises and deny the conclusion.

Probability: the likelihood that some possible event is actual, or that some possibly true proposition is true. All things probable are possible (logically possible: their concept involves no contradiction); equivalently, no things impossible are probable. All things actual are possible; equivalently: nothing that is, is impossible.

³⁵ See Daniel Kahneman and Amos Tversky, "On the Psychology of Prediction" Oregon Research Institute Bulletin 12 (1972) no. 4.

For questions about the experiments' implications, L. J. Cohen, "Can Human Irrationality be Experimentally Demonstrated?" The Behavioral and Brain Sciences 4 (1981) 317–67; "Are People Programmed to Commit Fallacies? Further Thoughts about the Interpretation of Experimental Data on Probability Judgment" Journal for the Theory of Social Behavior 12 (1982) 251–74. And for an assessment of everyday risk assessment less skeptical than Kahneman, Tversky, see the work of Gerd Gigerenzer, especially Adaptive Thinking: Rationality in the Real World (New York: Oxford UP, 2000) and Simple Heuristics that Make us Smart ().

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