

Unpublished. First chapter of a proposed introductory textbook for psychology students.  
Circa 1970.

# Principles of Psychological Research

## Chapter 1

### The Scientific Enterprise: Its Nature and Nurture

#### Introduction

As forecast by its title, the intent of this book is to survey the essentials of psychological research, or, more precisely, of its central regions. In its broadest sense, *psychological research* may be defined as any studies designed to further the aims of psychology as a field of human endeavor. However, the various professional objectives of persons classified in our society as “psychologists” are remarkably diverse, and the ultimate goals of psychology’s engineering branches in particular—psychotherapy, counseling, industrial and educational psychology, etc.—are of a rather different sort from the disclosure-oriented pursuits of “pure” psychology. I want to make clear at the outset, therefore, that only the latter, i.e., *scientific* psychology is at issue here. I stress the adjective not to awe you with the magic this term so often conjures for the layman, but merely to put on record that as bannered by its verbal label and by the insistence of its most dedicated practitioners, *psych-ology* aspires to be first of all a “science,” whatever that means. While this is unlikely to come as startling news to you, it needs to be made explicit as the foundation on which this book rests. For my intent here is not to outline rituals commonly practiced by research psychologists in the course of an investigation, but to show how each procedural detail is dictated by simple but relentless logic by the inquiry’s goals *qua* science.

We shall begin, then, by examining the nature of “science” in some depth. It will soon become apparent that the boundaries of this notion are most unscientifically obscure, and the idealized definition I shall eventually propose will make its imprecision more evident. But that is a small matter; more important is for you to grasp the themes and directives which are harnessed within this concept, to become moved by its thrust. For the essence of science and scientific method is very different from what you may have been led to believe by grade school science courses and the popular image of science as a dehumanized ensemble of complex

instruments, occult skills, and impersonal facts. Basically, “scientific method” is nothing more than hard-headed common sense—though to be sure it is educated and disciplined common sense, which distinguishes it from garden varieties thereof. (Similarly, a professional athlete doesn’t do anything that you and I can’t do; he just does it a lot more effectively.) And as you will see, “impersonal science” is quite literally a contradiction in terms. Admittedly, not all scientific contributions are imaginatively original, any more than this is true of painting, music or literature. But at its best, science is fully as much an innovation and unfolding of ideas, equally well a creation by autonomous individuals passionately seeking to impose their personal vision of form and beauty upon the constraints inherent in a refractory medium, as is any of the expressive arts. In this chapter, I shall try to make you *feel* the character of this involvement. For unless you have an existential awareness of a scientist’s personal responsibilities, unless you can internalize the goals of scientific inquiry as your own, rehearsing you in the research methods of psychology or any other scientific discipline would be like training you to recite the poetry of an alien tongue.

### The Concept of “Knowledge”

What, then, is “science”? Most any dictionary will define it as a *systematized body of knowledge*, or some close paraphrase thereof. This implies that science as a pursuit—i.e., the actual *doing* of scientific inquiry may be described simply as “attaining knowledge,” or at least knowledge which is “systematic” in some appropriate sense. While this definition will soon prove to be intolerably restrictive, it will serve as a good initial approximation: “knowledge” or something very like it is surely the ultimate *goal* of science.<sup>1</sup> But what is “knowledge,” anyway? What are you looking for when you seek it? What must you do to find it? And if perchance you encounter some, how will you recognize it for what it is? These are not rhetorical questions. Pause a moment to think about them and to realize how poorly you understand what is meant by “knowledge.” We must now examine this concept with some care, for within it are rooted all the main directives of scientific method.

The first and most fundamental insight into the nature of “knowledge” is that *knowledge exists only in persons, not apart from them*. For the abstract noun “knowledge” merely reifies the verb “to know,” and *knowing* is a condition attained only by specific individuals on particular occasions. To be precise, knowings are events described by sentences of form

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<sup>1</sup>While a word’s etymological origin is often but a feeble clue to its contemporary meaning, it is worth noting that the term “science” comes directly from the Latin word *scire*, meaning “to know.”

$s$  knows (has known, will know)  $X$ ,

in which  $s$  is some particular person and  $X$  is something he knows (or knew, or will know). For you to acquire “knowledge,” therefore, is for you to change in such a fashion that one or more predicates of form “\_\_ knows  $X$ ” become true of you. Only insofar as there are, in fact, persons who possess attributes described by such predicates is there such a thing as “knowledge.”

From what has just been said, it is evident that a knowledgeable person doesn’t just *know*, period, but knows one or more particular things. Your knowledge is the totality of your various specific knowings, while there are as many kinds of knowledge as there are different categories of expressions which can meaningfully replace “ $X$ ” in the sentence-form “ $s$  knows  $X$ .” Our next task, therefore, is to examine what *sorts* of things a person might in principle know. The most powerful way to begin such inquiry is to look for major grammatical differences among expressions purporting to designate objects of knowledge. Consider, therefore, the following instances of schema “ $s$  knows  $X$ ” as we actually use it in everyday life:

- (1) John knows *that it rained last night*.
- (2) Jane knows *that 4 times 9 equals 36*.
- (3) Jim knows *who stole the money*.
- (4) Joyce knows *where the meeting will be held*.
- (5) Janice knows *why the lecture was cancelled*.
- (6) Jill knows *when to remain silent*.
- (7) Jerry knows *what to do for snakebite*.
- (8) Jean knows *how to swim*.
- (9) Juan knows *Spanish*.
- (10) Jake knows *the mayor’s brother-in-law*.

Despite the considerable variation in logical form among these italicized “objects of knowledge,” all resolve under analysis into one or another of two basic types, namely,

I: knowing *that*  $p$ ,

where  $p$  is a proposition, i.e., what is expressed by a grammatically well-formed declarative sentence; and

II: knowing *how to*  $d$ ,

where  $d$  is some complex habit or skillful activity. Types I and II are clearly illustrated by examples (1) & (2) and (8), respectively, while (3)–(5) are also straightforward, though more subtle instances of I. For while the italicized phrases in (3)–(5) literally express questions, what is meant in such cases is that the person involved knows some proposition which *answers* the question indicated. For example, (3) would not be true unless there is someone,  $x$ , such that Jim knows that  $x$  stole the money. The everyday vagueness of examples (6) & (7) leaves them somewhat more problematic than (1)–(5) and (8). However, if we ask what must be true of a person whom we would say knows what to do for snakebite or knows when to remain silent, we come up with a list of facts and techniques which that person must know in senses I and II, respectively. Finally, while examples (9) and (10) are grammatically far removed from forms I and II, it can again be argued that these are highly condensed, ambiguous, shorthand for a cluster of knowings-how and knowings-that. Thus knowing Spanish is being able to speak and understand it (know-how); while knowing the mayor’s brother-in-law includes having first-hand knowledge of various facts about him, knowing how to influence his behavior in desired ways, and so forth.

Knowing how to do something is, on the face of it, a very different sort of thing from knowing that something is the case; and were not the claim somewhat controversial (see Ryle, 1949) I would flatly assert that only the latter is “knowledge” in the primary sense of the word. However, all that matters here is that you be able to distinguish propositional knowledge—i.e., type-1 knowings—from skills and other non-cognitive attributes which ordinary language also speaks of as knowable. For the “knowledge” sought by science is specifically propositional knowledge, and the character of scientific method is imposed specifically by the requirements which must be satisfied if a proposition is to qualify as “known.”

What does it mean to “know” something? Most philosophers who have analyzed this concept substantially agree that a person  $s$  knows that  $p$  is the case if and only if

- (1)  $s$  believes that  $p$  is the case,
- (2)  $p$  is the case,

and

- (3)  $s$  is justified (warranted, rational) in believing  $p$  to be the case.

That is, propositional knowledge is believing what is true with good reason. Thus it is logically absurd to say that John both knows and disbelieves that it rained last night, or that he both knows this and is uncertain about it. The absurdity is like that of wondering if many bachelors practice bigamy—if you don’t agree

that the suggestion is self-contradictory, these words just don't mean the same to you as they do to most English-speaking persons. Similarly, it is conceptually impossible for John to know that it rained last night if it didn't rain then. And finally, even John's believing truthfully that it rained last night does not count as "knowing" if the circumstances under which the belief arose made its truth a mere lucky accident. Suppose, for example, that John is a farmer whose crops are withering under a protracted drought, and that his irrepressible optimism and desperate yearning for rain cause him to awaken each morning with the conviction that it must surely have rained that night. Then if at long last it did rain last night, the fortuitous truth of John's waking conviction this morning that it rained last night does not change the fact that John has no good reason for believing this and hence cannot properly be said to know it.

### From "knowledge" to "science"

The analysis of "knowledge" offered above is no more than an outline of what a technically detailed fathoming of this concept would disclose. Even so, it suffices to lay before us the major conceptual components which, with some trimming and filling, we shall now begin to assemble into a working model of "science."

If propositional knowledge is justified true belief while a science is a systematized body of propositional knowledge, then *a science is a set of beliefs*—and this remains so regardless of what we mean by "systematized" and "justified," or even if we relax (as we soon will) the truth requirement. But *beliefs are properties of believers*, i.e., they are mental states of individual persons at specific times. In particular, while a true belief *represents* (signifies, is about) a fact (event, state of affairs) which is generally independent of the believer, namely, the fact whose existence makes the belief true and whose failure to exist would have falsified it, the belief and the fact represented by it are two entirely distinct entities. For example, if John correctly believes that it rained last night, this belief is an aspect of John's present mental condition which is *about* last night's rainfall and is true because it *did* rain last night; but it would still be a present condition of John—though then a false one—even if there had been no rain. Thus not merely is a science more than a collection of facts, it does not include any facts at all. Rather, it is a set of mental conditions whose special character as a *representation* of facts does not make them any less internal to their possessors. This is one reason—though only the first—why I insisted earlier that science is inherently personal.

As a purely grammatical maneuver, we may say that a belief is "scientific" if and only if it is one of the beliefs which, in aggregate, constitute a science. Then our main task in this chapter is to clarify what *in practice* is required of a belief in order for it to be thought of as "scientific." The emphasis on practicality is to recognize the difference which often exists between textbook-type verbal definitions

of a concept and the working criteria by which persons who use this concept judge its applicability on real occasions. Inasmuch as professional scientists do, in fact, discriminate beliefs which they consider to be scientific from those which they do not, a treatise on the actual *doing* of science needs to identify the operational basis of such judgments. Moreover, since real-life judgments inevitably reflect to some extent the personal perspectives of their makers, you should begin to brace yourself for the possibility that a practical criterion for what is “scientific” may yield conflicting results when applied by different persons.

From our provisional definition of science as propositional knowledge and the latter as justified true belief, it would follow that in order to be scientific, a belief must be both justified and true. What happens if I actually try to use this criterion? Suppose that I wish to determine whether a certain conviction of mine, say, that the Mississippi delta is in the state of Mississippi, meets the standard just proposed. To apply the truth test, I must decide whether it really is the case that the Mississippi delta is in Mississippi—except that my verdict on this is already presupposed by the belief being tested inasmuch as I cannot be convinced that the Mississippi delta is in Mississippi even while judging this not to be so. That is, in more general terms, it is not within my power to distinguish those of my beliefs which are true from those which are false, for any proposition which I consider to be false is perforce not believed by me. Similarly, if I ask myself whether I am justified in believing that the Mississippi delta is in Mississippi, my answer is that inasmuch as the delta is in Mississippi—for any proposition which I feel sure is true is for me a perfectly sound premise on which to base an argument—what better reason could I possibly have for believing this. Or to turn the point around, anything which makes me suspect that my belief in a proposition  $p$  is not wholly rational thereby creates some doubt in me about the truth of  $p$  as well. So neither can I fault any of my beliefs on the ground that I am not justified in having them.

In short, the requirement that scientific beliefs must be both true and justified is operationally vacuous when applied by me to my own beliefs for the simple reason that I just don’t believe anything which I think fails to meet this standard. (More precisely, I never feel *sure* of anything which seems to me to be defective in either of these two ways. This raises the issue of *degrees* of belief, which will soon command a great deal of our attention.) Only when I pass judgment on the scientificity of *your* beliefs (or those of some other person, even perhaps myself at an earlier period in life) do I encounter beliefs which I can classify as false or unjustified. Thus if you believe that the Mississippi delta is in Louisiana while I think it is in Mississippi, I will conclude that your belief fails the truth test and hence, if truth is a requirement of science, that it is not a scientific one.<sup>2</sup> On the

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<sup>2</sup>I have deliberately chosen an example wherein I am the one who is wrong in order to emphasize that my judgments are always based not on what is in fact the case but only on what I believe to be the case.

other hand, by the very same logic, *you* consider all *your* beliefs to be both true and rational, but are not nearly so charitable when judging mine. So if we adopt this standard for what is scientific, there is very little hope that you and I (or any other two persons) can ever reach agreement on which beliefs are the scientific ones.

From the foregoing, we see not only that our initial identification of “science” as knowledge has only dubious merit as a practical criterion for what is scientific, but also that it may well prove difficult, if possible at all, to avoid personal outlook in the application of such a criterion. You will forgive me, therefore, if I adopt an unabashedly egocentric viewpoint for the remainder of this chapter. I will, however, try to keep it a *shared* egocentricity—i.e., one which, with an appropriate interchange of pronouns, is yours as well.

When I seek propositional knowledge, what am I actually trying to do and how do I go about it? To say that I am searching for Justified True Belief would be grossly pretentious, for as you have seen, I am entirely incapable of discerning within the total aggregate of my beliefs the saintly glow of those which are also justified and true. In operational practice, my Quest for Knowledge amounts to nothing more than doing whatever I can to increase the quantity of my convictions about matters which concern me. To be sure, many beliefs arise in me without active desire for them on my part, e.g., my auditorily inspired opinion that a mosquito is in the bedroom or that the couple next door is throwing another wild party. But feelings of puzzlement and uncertainty often goad me into actions designed to bring me beliefs which alleviate these urgings. Before pursuing this theme, however, we must first attend to another important point which has so far been slighted.

Except for one premonitory parenthesis, I have spoken of belief as though this were an all-or-none affair—i.e., either a person believes a particular proposition or he doesn't. But of course real-life believing is a matter of degree, coming in all shades of intensity from absolute conviction through modest assurance down to neutral uncertainty, scepticism, and finally, at the other extreme, utter disbelief. For example, I feel quite sure that the Mississippi delta is actually in Louisiana, confident but by no means certain that I will receive a promotion next year, and highly dubious that my research assistant will be able to run my rats for the rest of the week without the apparatus breaking down again. To speak merely of “believing *p*,” as done in our earlier analysis of “knowing *p*,” is to suppose a level of conviction somewhere near the high end of this continuum while leaving vague just how strong.<sup>3</sup> Similarly, acquisitions and losses of beliefs are most accurately

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<sup>3</sup>The absurdity of such statements as “I know that *p* is the case but have some doubt about it” shows that the degree of belief required to “know” a proposition *p* is in principle conviction beyond the slightest trace of doubt. However, in everyday life we often say people “know” things

characterized as upward and downward shifts in belief strength. It is important to note that “doubting” a proposition  $p$  is not necessarily to disbelieve  $p$  but only to feel less than completely sure of it. I can have some doubt about  $p$  even when at the same time I believe it rather strongly. Moreover, to believe  $p$  minimally—i.e. to be entirely convinced that  $p$  is false—is also to have no doubt about  $p$ . Doubting, or feeling uncertain, is believing at any intensity intermediate to the two polar extremes.

When I spoke a moment ago of being goaded to seek beliefs, what I chiefly wanted to point out (though this is only one variety of epistemic<sup>4</sup> motivation) is that doubts tend to be disturbing. To be sure, uncertainty is not always bothersome—I bear up superbly, for example, under my ignorance of how many miles the average sturgeon swam last year—but very often awareness that my belief in a proposition  $p$  is appreciably less than extreme disquiets me in much the same way as do hunger, frustration, boredom, lust, and other psychological drives. And when doubt about  $p$  does so affect me, my  $p$  uncertainty drive becomes satiated only as I become either sure that  $p$  is the case or sure that it is not.<sup>5</sup> But freeing myself of doubt about a proposition  $p$  is not in itself a voluntary action which I can perform in the way, e.g., I can ease a stiff muscle by electing to stretch it. In particular, I am quite incapable of changing the strength of my  $p$ -belief simply by deciding to believe or to disbelieve  $p$ . To induce a feeling of certainty about  $p$ , all that I can do is to engage in actions aimed at bringing about the conditions which drive my belief in  $p$  toward one extreme or the other. (In like fashion, when I am feeling low I can’t cheer up by an act of will. But I can go to a movie, look up a friend, or place myself in some other situation which I think may lighten my mood.) Anything I do in hope that it will have this effect is “pursuit of knowledge”; and any procedure which I think will help me to achieve the desired resolution of doubt is, for me, “scientific method.”

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about which they have high but by no means perfect confidence.

<sup>4</sup>EPISTEMIC, *adj.* pertaining to knowledge or its acquisition.

<sup>5</sup>Frequently, the distress of  $p$ -uncertainty originates in the need to feel sure about  $p$  in order to make some practical decision without inner conflict. (Thus my uncertainty over what the stock market will do between now and next January may agonize me because I must decide when to sell some securities before then.) But this is not always so, at least not in any obvious fashion. A person may yearn to know whether  $p$  is the case simply because learning this is inherently rewarding to him in the same way, e.g., that sexual and artistic experiences are prized for their own sake. The myth that science, unlike the arts, is emotionless and impersonal is propagated largely by those who are tone deaf to the powerful esthetic qualities that well-designed belief structures may possess. The latter are, of course, by no means the only source of human value, and someone who lacks the capacity for this form of gratification cannot be blamed for seeking his kicks elsewhere. But I resent and reject the imputation found in so many humanistic writings today that a person who finds his deepest, most meaningful experiences in the development of cognitive systems, rather than in artistic involvements, interpersonal interactions, or handwriting over the condition of man, is a little less than fully human.



“But,” you protest, “surely not all routes to conviction are equally legitimate. What if, for example, you very much want  $p$  to be the case and talk yourself into believing it by repeatedly and fervently hoping for  $p$ ?” I would accept this criticism if we were discussing your beliefs, or those of some third person, but in my case it is irrelevant. For were I to think that I believe (or disbelieve) proposition  $p$  as strongly as I do only as a result of influences which I consider to be unworthy, this metabelief<sup>6</sup> would *reduce* the extremity of my  $p$ -belief to a level of uncertainty at which the disapproved influences seem properly discounted. Thus if I thought my faith in  $p$  were due merely to desire that  $p$  be the case, this would automatically cause me to feel less sure of  $p$ . While I concede that some of my past convictions may have been unjustifiably extreme, the strengths of my beliefs now are entirely reasonable according to my present standards of rationality; and any procedure which, in my view helps me to approach what I consider to be knowledge—i.e., in me, now, any strong belief—is then perfectly respectable scientifically.

While the preceding remarks scarcely begin to exhibit the full complexity of interplay between beliefs and metabeliefs, enough has been said to make you aware that properly understood, *the concept of what is “scientific” imposes no restrictions on how you personally manage your beliefs*. It does not intend that you regard some of your beliefs as respectable because they meet some external standard for being “scientific” while others, which are privately as plausible to you as the former, are disreputable because they fail this test. Rather, the term is to be interpreted by you to subsume whatever it is that *you* consider believable. And above all, it lays stress upon *your inescapable personal responsibility for what you believe*—not in the sense that you voluntarily select your beliefs, but in that for better or worse, how strongly you hold your beliefs at any given moment is precisely the level which seems rational to *you* then. As will soon be evident, this does not mean that I necessarily concur with the soundness of your judgment, nor does it imply that you have nothing to learn about effective reasoning from study of how science is practiced by professionals. But no procedure for extremizing convictions, regardless of its acclaim by its partisans, is scientific *for you* unless it makes good sense by *your* comprehension of what is reasonable.

I now resume my egocentric soliloquy with, however, somewhat less expected universality than before. What I say about myself *should* apply to you also; but if in some respects it does not, it will be up to you to spot any later conclusions jeopardized by the points of disagreement and to revise the argument in whatever way is most appropriate to your own perspective.

While I have given an overview of what “scientific method” is for me, I have yet to specify which of my beliefs I consider to be scientific. At first thought, all that makes this still a problem is the continuity with which confidence shades into

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<sup>6</sup>METABELIEF, *n.* a belief about a belief

uncertainty. According to the “knowledge” criterion, my belief (or disbelief) in a proposition  $p$  is scientific only if I feel completely sure that  $p$  is (or is not) the case. But then none of my beliefs would qualify as scientific for the simple reason that I don’t feel *that* certain of anything. Even my strongest convictions are tinged by traces of doubt, and the inferences I draw from them are even more hesitant. If the notion of “scientific belief” is to have any practical use for me, then, I must at the very least countenance its application to beliefs which, though held with considerable confidence, are not entirely doubt-free. This construes the degree of belief required for “knowing” as practical assurance rather than as ideally absolute conviction. But further complications remain. The first, a relatively superficial one, is the difficulty of naming a precise level of strong but uncertain belief and the arbitrary foolishness of partitioning my beliefs as “scientific” vs. “unscientific” at just this strength. (To avoid such an artificial dichotomy, it would be better to regard the scientificity of my beliefs not as all-or-none but as a matter of degree corresponding to the intensity of my conviction.) A more serious objection to this or any other alignment of scientific/unscientific with confident/uncertain, however, is that to label a belief as “unscientific” is to imply that it is unsound, naive, foolish, or otherwise intellectually defective; whereas the thoughtful withholding of conviction, pro or con, is often the rationally correct strength of belief under the circumstances. *If the basis for my belief in a proposition  $p$  does not warrant high confidence in  $p$ , then it is pragmatically and intellectually optimal for me to hold  $p$  in a commensurate degree of doubt, regard less of how strongly I may wish to be sure about  $p$ .* (You will have no trouble imagining situations involving, say, gambling or interpersonal intimacies in which excess confidence leads to costly, embarrassing, or tragic outcomes which could have been averted by a few doubt-induced precautions.) But if my belief in  $p$  is neither more nor less hesitant than it *should* be—and were I to be aware of any discrepancy between the way I think it is reasonable to believe and the way I do believe, this would work an adjustment on the latter to bring it into line with the former—then it is fully as meritorious as my stronger convictions even if less satisfying than them. Consequently, I refuse to stigmatize any of my beliefs as “unscientific” merely because they suffer from a humble degree of confidence. For the same reason, no matter how profusely I may damn your opinions as “unscientific” on other grounds, I am likely to regard any doubt you may feel in them to be more a virtue than a defect. Nor is this an idiosyncrasy in my usage of “scientific,” for virtually all professional scientists emphasize the *tentativeness* (to whatever degree seems appropriate) of their scientific conclusions.

Although the dictionary conception of science as “knowledge” thus founders under its naivete about uncertainty, its spirit—and the real essence of this concept as I understand it—is captured by thinking of “science” simply as *rational belief*, where the latter in turn is *appropriate intensity of conviction*. A person’s belief

in proposition  $p$  is scientific to the extent that its strength approximates the level which is *justified* (warranted, supported, made correct) by the grounds he has for believing  $p$ . (Note that “scientific,” so construed, is not all-or-none but a matter of degree.) However, this improved definition does nothing to purge the adjective “scientific” of its egocentricity; for what I regard as the appropriate strength of  $p$ -belief under a given set of circumstances is determined by what makes sense *to me*. And since my standards of sensibility need not wholly coincide with yours, we can agree that science is rational belief without any notable consensus on which beliefs are the rational ones.

Moreover, I am not quite content to define “science” *merely* as “a set of beliefs whose intensities are appropriate to the grounds their believers have for them.” Something also needs to be said about veridicality. For example, the belief held with moderate confidence by medieval alchemists that lead can be transmuted into gold, and the even stronger conviction of 19th Century chemists that this is impossible, were both rational enough considering the evidence available at their respective times; but when saying that these conflicting beliefs of different eras were more or less equally scientific and that all in a sense belong to the corpus of science, I also feel obligated to add—lest the impression be given that they are equally *true*—that it was the alchemists, apparently, who were right even though the nuclear adjustments required for the transmutation were far beyond their technical capacity then. However, my rating of the truth-status of another person’s  $p$ -belief can only mirror *my* opinion whether  $p$  is the case. Just how I work this into the definition of “science” will be deferred until later, but evidently what science is for me depends not only on my personal standards for rationality but also to some extent on what I personally believe to be true about the world.

### Grounds for Belief

By now, you must be as impatient as I am to have done with definitions and to get on with the actual doing of science. For the sake of closure we shall eventually have to give this word “science” a final shakedown, but from here on our concern will be mainly with things having direct, operational relevance to the scientific quality of your thinking. A moment ago, I stipulated that beliefs are “rational,” or “scientific,” to the extent that their respective strengths are appropriate to the grounds on which they are held. We shall now survey the main types of “grounds” from which beliefs apparently arise, and reflect upon the levels of conviction they justify. As I should not have to remind you but had better do anyway, this review does not begin to explore the psychophilosophy of belief with any technical depth. The present intent is just to insure that you are aware of these influences and to prompt you to ask yourself whether you are satisfied that each controls your

thinking to the degree that you consider seemly. Those aspects of belief production which are especially critical for practical research will be discussed more thoroughly in Chapter 2.

## Inference

Suppose you are deeply convinced that (a) all negroes (or honkies, or jews, or dagoes, or gringos, or whatever your favorite ethnic antipathy may be) are undesirables. If you now learn that (b) the man who bought the house next door is a negro (or etc.), it is overwhelmingly likely that you thereupon also become agitatedly certain that (c) the man who bought the house next door is an undesirable. Why? Because you would undoubtedly infer belief in proposition (c) from your beliefs (a) and (b). By “inference” is meant any psychological process wherein the strength of a person’s belief in a proposition  $q$  derives from (or is at least modified by) the strength of his belief in one or more other propositions  $p_1, \dots, p_n$  by virtue of  $q$ ’s apparent relation to  $p_1, \dots, p_n$ ; while a relation  $R$  is an “inference pattern” for a person  $s$  if  $s$ ’s awareness that propositions  $p_1, \dots, p_n$  and  $q$  stand in relation  $R$  generally creates a dependency (not necessarily a total one) of  $s$ ’s  $q$ -belief strength upon the strength of  $s$ ’s belief in the conjunction of  $p_1, \dots, p_n$ .<sup>7</sup> Thus in the example just given, proposition (c) is related to propositions (a) and (b) by the formal structure

$$\begin{array}{l} p_1: \text{All } X\text{s are } y\text{s} \\ p_2: \textit{i} \text{ is a(n) } x \\ \hline q: \textit{i} \text{ is a(n) } y. \end{array}$$

For most persons this schema is an inference pattern, for whenever it registers upon them that a proposition  $q$  is linked with other propositions  $p_1$  and  $p_2$  in this way (even if they are unable to verbalize the connection or do not pause to reflect upon it), their confidence in  $q$  swells to at least the level of their conviction in  $p_1$  and  $p_2$ .

In brief, then, “inference” is the transmission of belief-strength from one proposition to another, while inferred beliefs are those whose intensities (at whatever

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<sup>7</sup>Technical note: These definitions slide gingerly over several important questions which to date have scarcely been raised, much less solved, by the philosophy of inference—notably, whether any propositional relationships other than logical structure can in principle qualify as inference patterns, and to what degree, if any, must a person consciously recognize that certain propositions are linked by one of his inference patterns in order that a channeling of belief from premises to conclusion be instated in him. Whatever may be the proper clarification of these points, “awareness” that certain propositions stand in a particular inferential relation should not be construed to require that the inferrer is able to state in words what it is that he is aware of, nor that this awareness necessarily occupies the focus of his attention or is contemplatively protracted in time.

level) have the strengths of other beliefs for their grounds. Although the inference pattern illustrated above happens to be *deductively valid*—its conclusion is necessarily true whenever its premises are true—deductive inferences occur much less frequently in real life than does the flow of belief through “nondemonstrative” inference patterns such as

$$\begin{array}{l} p_1: \text{Most } X\text{s are } y\text{s} \\ p_2: \frac{i \text{ is a(n) } x}{\phantom{i \text{ is a(n) } y.}} \\ q: i \text{ is a(n) } y. \end{array}$$

which discharges only a portion of its premises’ belief-strength into its conclusion. How strongly acceptance of an inference’s conclusion is *justified* by a given degree of belief in its premises depends profoundly upon the particular inference pattern involved. You are pretty much on your own in this respect, for while technical research in the philosophy and methodology of science has finally begun—barely—to develop the general theory of inference (i.e., in which deduction is merely a special case), useful results have so far emerged only in certain areas of statistical induction (see p.?? ff, below), and even here it remains controversial how inference should best be guided by these findings. As a professional thinker (or even just as a mature intellect), it is your important responsibility to identify those patterns of inference which govern your own personal thinking; to judge for yourself whether your conclusions still feel justified now that you are consciously aware of deriving them in this way; if they do not, to train yourself to channel your reasoning through inference patterns whose convincingness survives your critical examination of them; and if they do, to prepare to defend your beliefs so derived against the objections of others who fail to comprehend this argument’s force.

It is of some importance for you to appreciate that learning which inference patterns are considered by professional logicians to be deductively valid (or to have some other commendable status) is no substitute for learning to reason by those patterns. You can “know” in a superficial sort of way that a proposition standing in relation  $R$  to premises  $p_1, \dots, p_n$  is certain or very likely to be true if these premises are true, and still remain dubious about  $q$  while feeling confident of  $p_1, \dots, p_n$ . Even if your sophistication in formal logic allows you to derive belief in proposition  $q$  from the joint premises

- ( $p'_1$ ) any proposition related to true premises by a deductively valid inference pattern is also true,
- ( $p'_2$ )  $q$  stands in relation  $R$  to propositions  $p_1, \dots, p_n$ ,
- ( $p'_3$ )  $R$  is a deductively valid inference pattern,
- ( $p'_4$ )  $p_1, \dots, p_n$  are all true,

this is still not the same as deriving belief in  $q$  directly from your belief in  $p_1, \dots, p_n$  when you see that  $q$  is  $R$ -related to the latter. Inference by pattern  $R$  is not a cautious, dispassionate appraisal that inasmuch as  $q$  is  $R$ -related to  $p_1, \dots, p_n$  and  $R$  meets the approval of sound reason, it is therefore appropriate to believe in  $q$  given belief in  $p_1, \dots, p_n$ . Rather, it is a hot-blooded intellectual commitment in which your sensing the  $R$ -relatedness of premises to conclusion triggers an immediate, involuntary flood of conviction into the latter, modulated only by your lack of certainty about the premises and the coefficient of restraint built into the  $R$ -pattern's control of your thinking. (It was to display this inferential immediacy that I chose a high-voltage example to begin this subsection, rather than the traditional "All men are mortal; Aristotle is a man; therefore Aristotle is mortal.") If you cannot recognize in your own experience this driving of beliefs toward one extremity or another by the intensity of other convictions in accord with some detectable pattern, you have no basis for thinking that you know how to reason—logically or otherwise.

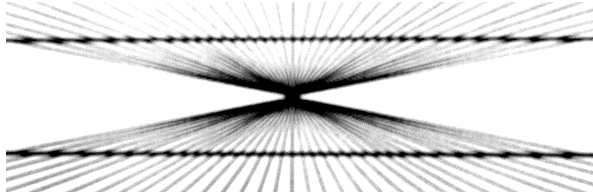
## Observation

I look out the window this lovely spring afternoon and find myself believing that the dandelions are in bloom again. What justification have I for believing this? Simply that I *see* (observe, perceive) that the dandelions are blooming again. Anyone who has ever taken a high school science course "knows" that observation is the cornerstone of scientific method. But not so widely appreciated is how precarious and, in professional science, how sophisticated an enterprise observation actually is. Technical problems of observation in research will occupy much of our attention in Chapter 2; here, we are concerned only with its general character as a basis of belief.

In the first place, seeing is indeed believing. That is, to observe that  $p$  is the case is, in part, to *believe* that  $p$  is the case. This needs to be made emphatically clear, because observational beliefs usually feel so immediate, so indubitable, that the term "belief" (which in common parlance often suggests considerable uncertainty or unfounded opinion) scarcely seems appropriate to them. Yet when I observe that the dandelions are in bloom again, I am vividly entertaining the proposition, the dandelions are in bloom again, with unhesitant confidence—i.e., my present experience leaves me feeling quite sure that this is true.

On the whole, my observational beliefs enjoy the highest levels of confidence ever attained by my convictions. This is, however, by no means true of all my observations. This crucial point—that to observe is not necessarily to be sure of—is obscured by the predilection of ordinary language to attribute the uncertainties in my observational beliefs to my construing them as "observations" rather than

to the observations themselves. Thus I may complain: “I think I taste mutton in this soup” (rather than “I taste mutton in this soup” or simply “There is mutton in this soup”) if my gustatory impression of mutton is too dim for me to trust its accuracy. With similar intent, when I look at the figure



I tell myself that the horizontal lines *appear* to be bowed, rather than that they *are* bowed, because I suspect that my observational belief in the lines' curvature is in fact erroneous. While these two examples differ importantly in detail, both exhibit my tendency to rephrase an uncertain observational belief as a claim about my act of observation. In this way I am misleadingly able to avoid admission that I observe  $p$  to be the case when I have some doubt about  $p$ .

The identifying mark of an “observational” belief is the distinctive richness, immediacy, and brilliance of the sensory vehicle which conveys the belief's propositional content, and the intimacy with which belief and vehicle are fused. By the “vehicle” conveying a proposition, I mean the sort of thing which differs when you read an assertion in print rather than hearing that same proposition embodied by a spoken sentence, or when the same thought is expressed in different languages. In like fashion, when I see (or hear, or taste, or introspect, or otherwise perceive) that something is the case, the propositional content of this perception—i.e., what there is in it which can alternatively be expressed in words<sup>8</sup>—is presented to me through a configuration of sensory qualities which, even more than spoken or written language vehicles, are difficult though not impossible for introspection to distinguish from the cognitive meanings they convey.<sup>9</sup>

Although observational beliefs receive their special coloration from their non-verbal sensory carriers, you must not succumb to the common but deadly fallacy of thinking that these sensations are themselves what you observe. When I see, e.g., that the dandelions are blooming again, light reflected from the flowering dandelions strikes the retinas of my eyes, and from there an altered pattern of

<sup>8</sup>That is, which in *principle* can be so expressed. The linguistic resources which in fact I now possess may not be fully adequate for the job

<sup>9</sup>*Technical qualification:* Actually, it is possible that some features of the sensory qualities which convey an observational belief are themselves part of the belief's cognitive meaning. What I have in mind here is a speculation regarding the psychophilosophy of intentionality far too advanced for discussion at the present level; but if correct, it explains why perceptual beliefs seem so much more indubitable and immediate than do beliefs embodied by language vehicles.

neural activity is propagated into my central nervous system wherein, somewhere, somehow, it arouses a perceptual belief that the dandelions are blooming again. But what this belief is *about*—i.e., what it is that I am observing, the state of affairs in virtue of which my belief is *true*—is the condition of the dandelions, not the illumination on my retina, the excitation in my optical nerves, or any of the other events which causally mediate between my belief and its object.

But do I really observe the external events I claim to observe? When I “see” that the dandelions are blooming again, have I not actually inferred this belief from something else which is what I really saw? For example, the dandelions cannot be blooming *again* unless they once bloomed before and then stopped—and surely I do not observe these past happenings as I look out the window. You may argue, therefore, that at most I observe that dandelions are blooming *now*, and infer the “again” bit from this and my memory of the dandelions’ past behavior. Although I don’t recall making any such inference when I first looked out the window, I agree that following your admonition to be more careful about my observational reports, I see only the dandelions’ present blooming, accompanied by memory-beliefs about what they did previously. But then you press me further. Do I see *dandelions* blooming now, or merely some distinctively shaped and colored flowers which I infer to be dandelion blooms? And do I see *flowers* or merely some colored objects which I *infer* to be flowers? (Someone might, after all, have scattered paper decorations on my lawn.) Ultimately by this line of probing you challenge me to admit that all I ever really observe is that I have certain sense impressions of such-and-such a character, from which I then infer beliefs about events external to my mind. The nature of your argument is that whenever I claim to observe a state of affairs  $p$  while analysis of what is required for  $p$  to be the case leaves me less than completely sure of  $p$ , I should concede that I have really observed some other state of affairs  $p'$  about which I feel more certain than I do about  $p$ , and that my  $p$ -belief derives from my conviction in  $p'$ . Pending further discussion of this possibility in Chapt. 2, it suffices to reply that even if, given my sensory stimulation, I *could* have observed  $p'$  and from there inferred  $p$ , it does not follow that I *did* arrive at my  $p$ -belief in this way. When I look out of the window in spring, what I normally see is dandelions in bloom, not yellow patches on the lawn or yellowish sensations in my mind. I *could* see these latter, perhaps, and from there infer the dandelions’ blooming, if I had trained myself to perceive in this way. But in fact my perceptual habits do *not* include seeing the world in terms of colored patches. When my retinas are stimulated by light reflected from dandelion blooms, the first belief aroused in my by this sensory input is simply that dandelions are in bloom here—and I especially do not have any beliefs on such occasions about my visual sensations, anymore than my utter ignorance about the psychophysiology of vision as a small child impaired my ability to perceive blooming dandelions then.

Underlying the thesis that sensations are what we really observe are the suppositions (a) that since observational beliefs are non-inferred they must be *certain*,



and (b) that we can be certain only of events within ourselves, specifically, only of our own experiences. But since a belief of mine is not the same as what it is *about*, no known causal or logical mechanism guarantees its accuracy beyond all possibility of error even when it is an introspective observation of my own internal condition. (Could. I be mistaken, e.g., in thinking that I feel elated? Yes indeed, at least in principle. Feeling elated and believing that I feel elated are not at all the same thing, and there is no logical reason why I cannot possess either one of these psychological attributes without the other.) Neither, when you stop to think of it, is there any reason why the starting beliefs from which I infer other beliefs need be free of all doubt so long as I am resigned to my conclusions' sharing the uncertainty of their premises. So there are no strong grounds on which to deny that observations are generally not-entirely-certain beliefs about the external world. Even so, philosophical problems of observation are not really critical here. All that matters for present purposes is that among my beliefs, some glow with a special experiential luminosity which sets them apart as "observational," *and that observational beliefs predominate among those convictions of mine whose strengths approach certainty.*

How strongly *should* I hold my observational beliefs? It is important for you to realize that your observing  $p$  to be the case (or, if you prefer, your believing that you observe  $p$ <sup>10</sup>) does not guarantee  $p$ 's truth; for this awareness will guard you against too much blind faith in your observations. On the other hand, it would be the height of foolishness—if you could do this—to mistrust your observations altogether. For in my own case (and remember, the way I think is essentially the way you *should* think), I am able to approach an extremity of conviction or disbelief in most of the propositions which concern me only by inferring them from my observational beliefs—which means, roughly speaking, that to the extent I doubt my observations, I cannot believe anything significant at all. In short, excluding logical truisms such as "Either it will rain tomorrow or it won't," observational beliefs are for better or worse the most trustworthy beliefs I have. The sign of their worth is simply that even with all my introspective sophistication about why

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<sup>10</sup>*Technical notes:* As already mentioned, ordinary language prefers to construe *observing*, like *knowing*, as a "success word" in that we prefer not to say that a person "observes" that  $p$  is the case unless  $p$  is the case. Hence in this sense of the term, to the extent that my observational belief in  $p$  is at less than maximal strength, I am also in doubt about whether I am really observing  $p$ . Whenever I speak here of "observational" beliefs, however, I refer to all beliefs which have the introspectively identifiable quality of observations, regardless of whether they are in fact true. It is also important to appreciate that identifying a belief as "observational" presupposes nothing about the sensory mechanisms by which it has been aroused, or even that any sense receptors are involved at all. Thus when I introspectively perceive that I feel elated, that I have a headache, or that I don't much like my wife's latest hairstyle—and these are perfectly good observations, with the same sort of vivid experiential immediacy characteristic of my seeing, hearing, feeling, tasting, or smelling of external events—it is highly problematic what sense organs, if any, mediate between these internal events and my awareness of them.

I believe as I do, and my alertness to so many subtle sources of error, I still hold my observational beliefs more strongly, on the whole, than I do beliefs of any other sort.

## Memory

I believe, with moderate assurance, that I had spaghetti for supper last night. Why do I believe this? Because I *remember* it. Just what happens when I think I “remember” something is such a tangled obscurity that I would gladly bypass all mention of this were not memory such a fundamental source of belief. The safest and perhaps here sufficient comment is that regardless of how I arrive at such judgments, I do in fact attribute many of my beliefs to something I call “memory,” and that on the whole my memory-beliefs command moderately strong though nowhere near extreme levels of conviction. However, something really needs to be said about the introspective signs of remembering, even if the account is flagrantly oversimplified.

In my own case (and presumably yours as well), remembering takes two primary forms which I will dub “1st degree” and “2nd degree,” respectively. When my belief in proposition  $p$  is a 1st degree memory, it is presented to me by a sensory vehicle (or “sensory-like,” if you prefer) with the same experiential character as observation except for being dimmer, less vivid, more fragmentary and blurred, while the beliefs content has a not-here-and-now reference. Thus my memory just now of having had spaghetti for supper last night was carried by an image of myself and family at the dinner table with spaghetti on our plates and its taste in my mouth—an image which presumably is a weak, partial, and approximate reactivation of my suppertime experience yesterday. (This image arose spontaneously within me when I asked myself what I had eaten last night, which may largely be why it gives me a moderately strong *belief* about my past when essentially the same image, aroused by my attempt to imagine what a spaghetti dinner at home might be like, would not produce any belief in me at all.)

In contrast, my belief in a proposition  $p$  is a 2nd degree memory when it is accompanied by the metabelief that my present strength of belief is a revival of the degree to which I believed  $p$  on some previous occasion, together with, perhaps, some metabelief about the grounds for my  $p$ -belief then. For example, suppose that last week I finally convinced myself of mathematical proposition  $m$  by discovering a rigorous proof for it. At present, I still believe  $m$  even though I am not now reviewing its derivation; instead, my present confidence in  $m$  is justified by my belief that I *have* proved  $m$  even though I don’t recall at the moment just how the proof ran. (This latter belief of mine is very likely, though not necessarily, to have the character of a 1st-degree memory.) Similarly, I “remember”—in the

2nd degree—that the earth is approximately 8,000 miles in diameter, or that the American Civil War began in 1860, when I find myself believing this conjoined with some recollection of the circumstances (or at least a belief that there were such circumstances) which induced me to believe it previously.

As for the warranted strength of memory-beliefs, you must surely have learned by now from first-hand experience how unreliable your memories are, as judged by the frequency with which independent evidence concerning their truth has been disconfirmatory. In my own case, for example, I have a fairly vivid image of myself as a small child sitting in mother's washing machine—which I would feel sure pictures an event of my childhood did not my mother insist that this actually happened to my younger brother. I also clearly recall a childhood occasion on which I confidently dove over the upstairs balustrade and glided gently to the floor below. (Chances are that I once dreamed this, but nothing in the recollection itself marks it as memory of a dream.) Nor is it just my childhood memories that I mistrust. After writing, above, that I recalled having spaghetti for supper last night, I checked this with my wife and learned—rather to my surprise, though afterwards my own revised recollections agreed—that we had actually had pecan rolls, the spaghetti having been a night or two earlier. Neither are 2nd degree memories any less fallible than 1st-degree ones—only too often, for example, have I “remembered” proving theorems which I later found to be partly incorrect. This latter point is an especially important one for you to bear in mind, for in the overwhelming majority of cases where you think the source of your belief in a proposition  $p$  is that you have observed  $p$ , or inferred  $p$ , or etc., you are really just *remembering*—or seeming to remember<sup>11</sup>—that you observed  $p$ , or inferred  $p$ , or etc.; and the reservations you should have about this memory's accuracy undercut any extremity of conviction you might otherwise be entitled to feel in  $p$ . Like observational beliefs, the less-than-perfect reliability of your memories does not mean that you should not trust them at all. You have no practical option (even were this a choice actually open to you) *but* to accept remembering as a valid source of believing, for without it you would be an intellectual basket case: You simply do not have the sensory and mental faculties required to maintain any appreciable number of beliefs on the grounds other than memory.<sup>12</sup> For sound thinking, it is only necessary that you not feel more arrogantly sure of your memory-beliefs than

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<sup>11</sup>Since *remembering*, like *observing* and *knowing*, is ordinarily construed to imply truthfulness.

<sup>12</sup>*Technical note:* The number of beliefs which can simultaneously be present in your thinking is extremely small regardless of their source. However, we commonly extend the concept of “believing  $p$ ” to include not merely cases where the believer has an aroused  $p$ -belief in the foreground of his awareness but also belief dispositions which activate  $p$ -belief in the believer whenever a judgment about  $p$  becomes relevant to his thinking. (Thus in this familiar but extended sense of belief you “believed” five minutes ago that  $2+2=4$ , even though you weren't actively thinking it just then.) The number of such “latent” beliefs you can possess at any given moment is practically unlimited, but they are all memories.

is appropriate to your all-too-human limitations at correct recall.

### **Analyticity**

There is a famous parable allegedly told by Francis Bacon in 1605 to illustrate the merits of observation as a source of belief:

In the year of our Lord 1432, there arose a grievous. quarrel among the brethren over the number of teeth in the mouth of a horse, For 13 days the disputation raged without ceasing. All the ancient books and chronicles were fetched out, and wonderful and ponderous erudition, such as was never before heard of in this region, was made, manifest. At the beginning of the 14th day, a youthful friar of goodly bearing asked his learned superiors for permission to add a word, and straightway, to the wonderment of the disputants, whose deep wisdom he sorely vexed, he beseeched them to unbend in a manner coarse and unheard-of, and to look in the open mouth of a horse and find answer to their questionings. At this, their dignity being grievously hurt, they waxed exceedingly wroth; and, joining in a mighty uproar, they flew upon him and smote him hip and thigh, and cast him out forthwith. For, said they, surely Satan hath tempted this bold neophyte to declare unholy and unheard-of ways of finding truth contrary to all the teachings of the fathers. After many days more of grievous strife the dove of peace sat on the assembly, and they as one man, declaring the problem to be an everlasting mystery because of a grievous dearth of historical and theological evidence thereof, so ordered the same writ down.<sup>13</sup>

What makes this story amusing is the pleasantly condescending superiority with which we contemplate these sages' absurd reluctance to resolve their controversy in the obviously sensible way—and it is precisely because the young friar's solution is a little too obvious that I introduce the story at this time. It is clear that Bacon's brethren were pompous fools, not unlike certain real-life types who can be found in academic circles even today, but they were not fools merely because their first response to the horse teeth problem wasn't to dash out in search of a horse's mouth to peer into. Just how tricky it is to answer this deceptively simple-minded question, "How many teeth are there in a horse's mouth?", will not become fully apparent until later; right now, the relevant point is that before they tried anything else, it was perfectly sensible for Bacon's brethren to seek their answer by sheer reasoning. For suppose that the group had convened by Old Dobbin's stall, pried

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<sup>13</sup>While Munn's *Psychology* (Munn, 1961) has regaled a generation of psychology students with this parable, I have been so far unable to trace it to its source.

open his mouth, and counted 19 teeth. A disputant who had previously held out for horses' having 32 teeth might then have argued that this observation merely proved that Old Dobbin wasn't a horse. And why not? You will probably reply, after thinking about it, that a particular number of teeth is not a defining trait of horshood as you understand it but you have no right to assume this until you have thought it over. And if it were the case that nothing counts as a "horse" unless it has 32 teeth, then peering into a horse's mouth to learn how many teeth it has would be just as silly as amassing empirical<sup>14</sup> data on how many wives a bachelor has, how often water is liquid, or what percentage of forks have less than two tines.<sup>15</sup>

In short, some beliefs demand your allegiance simply on grounds that they are "self-evidently" true, which is to say that their very meanings preclude your being able to conceive of any circumstance under which they could be false. Propositions which are true (or false) solely by virtue of their meanings are said by philosophers to be *analytically* true (or false), and if the falsity of a proposition  $p$  really is inconceivable, this can only be because  $p$ 's meaning excludes all possibility of  $p$  not being the case, i.e., because  $p$  is analytically true. To be sure, the theory of analyticity is today in turmoil as never before, with philosophers and logicians increasingly aware of a need to recognize different kinds and degrees of analytic truth without yet knowing quite what to say (Putnam, 1962). (For example, the propositions "No bachelor is a bigamist" and "Anything which is red is colored" can be judged veridical just by thinking about them; but whereas the analyticity of the first is made manifest by replacing "bachelor" and "bigamist" with their definitions, no such definitional reduction to tautology is available for the second.) Neither is it always easy to tell whether a proposition is or is not analytic: I may be uneasily confident that  $p$  is the case because, while proposition  $p$  has a strong couldn't-be-otherwise *feeling* about it, I am still not wholly convinced that I have fathomed all its possibilities of falsification. One famous example of a *problematically* analytic proposition is Euclid's 5th axiom (i.e., the one about parallel lines), which generation upon generation of geometers found almost—but not quite—self-evident until 19th Century mathematics finally showed its falsity to be very conceivable indeed. Another example, even more important than Euclid's 5th axiom and still unresolved, the Law of Excluded Middle (i.e., the logical axiom that every proposition is either true or false), which seems absurd to deny even while its repeated complicity in the paradoxes which continue to fester at the heart of modern logic and mathematics suggests that it may not, in fact, be altogether

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<sup>14</sup>EMPIRICAL *adj.* pertaining to experience and observation.

<sup>15</sup>*Is* water always liquid? And do forks *never* have less than two tines? (E.g., do ice and steam still qualify as *water*, and is a fork which has been denuded of its  $j$  tines still a *fork*?) It is unlikely that you can answer these questions with perfect confidence, but the way to attain greater assurance is not by surveying the water and forks in your vicinity.

correct. So you see that the “mere” thinking required to determine whether a proposition is analytic may well be an extremely demanding, sophisticated kind of thought. What is involved in such thinking and how you can gain proficiency at it are fortunately beside the present point. It suffices here just to make sure you are aware that the strength of your belief in a given proposition sometimes follows immediately from your comprehension its meaning—that you believe it because its denial literally makes no sense to you. And if you disdainfully think that such beliefs hold significance only for philosophers and logicians, not for natural science, look at analyticity from its dark side: You may well be in doubt about some substantive issue, even to the point of seeking clarification through wholesale empirical research, when much confusion and misdirected labor on your part is due simply to your failure to work out the analytic implications of the concepts in whose terms your problem has been formulated.<sup>16</sup>

### Hearsay

Why do I believe that New Zealand is over a thousand miles east of Australia? Because I recently measured the distance on a map of the Pacific. Why do I think my rat apparatus has broken down again? Because my research assistant just phoned to report this. What makes you so sure that 3 times 7 equals 21? Possibly because you have worked it out, but much more likely because it was drilled into you in grade school. And why do you believe that your name is what you think it is? Because you have been told this by your parents and, perhaps, have seen it on a document alleged to be a copy of your birth certificate. These are a few simple illustrations of what, statistically speaking, is probably the most influential of all belief source namely, *hearsay*—or, if you prefer, “the voice of authority.”

When you are exposed to assertion of a proposition  $p$ , this has a pronounced tendency to induce in you a degree of  $p$ -belief roughly proportional to the assertion’s strength. (By “strength of assertion,” I refer to the fact that propositional communication involves (1) a symbolic expression of the transmitted proposition, accompanied by (2) “modal” cues of punctuation, spelling, sentence phrasing, tone voice, etc., which signal a particular degree of belief in the communication’s content. Thus the newspaper headline MAYOR GUILTY OF FRAUD! transmits the same proposition as does the headline *Mayor guilty of fraud?*, but does so with stronger assertorial force than the latter.) This susceptibility to received assertions is to be sure only a *tendency*, modulated by the circumstances in which you encounter them, but it is so pervasive, so insistent a tendency that the vast majority of your beliefs (or more precisely, of your belief-dispositions—see Footnote 12)

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<sup>16</sup>Superb examples of this are to be found, e.g., in the nature-vs.-nurture literature on the composition of intelligence, though neither space nor your presumed background allow me to substantiate this claim here.

at levels other than flat uncertainty are due at least in part to it. While “hearsay” is the most appropriate generic term for belief-determinants of this type, it includes much more than just unfounded rumor. In fact, the varieties of hearsay are so diverse that several distinct subtypes deserve separate recognition.

The most obvious form of hearsay is when you believe something to be the case only because you have been *told* this. The telling may take place orally—friendly conversation, television, a classroom lecture, etc.—or through your encounter with a more permanent record such as a book, letter, or newspaper. Its vehicle may be in conventional English or it may be some form of code which does not resemble language at all. (E.g., a roadmap or a photograph labeled with some person’s name may convey considerable information to you even though the medium of communication exhibits explicit sentence.) The assertion may have been intended for your reception, as when a friend confides a secret or you inspect a public document such as the one you are reading now; or you may in effect be an eavesdropper, as when you overhear conversation in a crowd, read reproductions of someone’s private papers in a history book, or (if you can do it) translate ancient business accounts from crumbling clay tablets. And the proposition or degree of conviction which comes through to you may or may not be what the assertor himself believes. The communication may, for example, be deliberately planned to deceive you. Or it may contain an ambiguity which its author meant one way while you took it in another. Or you may have missed a vital context cue, as when you mistake the telling of a make-believe story for a factual narrative.

An especially subtle form of believing what you are told arises when you are taught *methods* for arriving at answers. Let’s take an example: 135 times 246 is either 32,110 or 33,210 and I want you to figure out which answer is correct before reading further . . . . . Got it? A minute or so ago there was no appreciable difference between the strengths with which you believed that  $135 \times 246 = 32,110$  and that  $135 \times 246 = 33,210$ , respectively, whereas now you feel rather sure of one of these and disbelieve the other. Why? The immediate reason is that you *computed* the answer—i.e., you observed that a certain sequence of 18 operations performed on the symbols “135” and “246” yields one of the numerals<sup>17</sup> “32,110” or “33,210” rather than the other—but why do you believe that the number so derived does, in fact, name the product of 135 and 246? Unless you have been an unusually independent thinker regarding arithmetic, or have had a really good “new math” course, you believe that this operation converts the names of numbers into the name of their product mainly because as a child you were trained how to carry out this operation and coerced to answer questions of the form “How much is such-and-such times so-and-so?” by emitting the symbol so derived. Another example: Why do I believe the temperature outside my study just now is 76° Fahrenheit? Because

<sup>17</sup>Note that you manipulated only marks on paper—i.e., *numerals*—not the *numbers* to which they supposedly refer.

I observe a thermometer there with its red column aligned with the numeral “76” (more precisely, with a line  $3/5$ ths of the way between numerals “70” and “80”), and have been thoroughly conditioned to believe that in the absence of cues to the contrary (e.g., a crack in the tube or signs of calibration on a scale other than Fahrenheit), the numeral indicated by a thermometer column is approximately the Fahrenheit-scale value of the temperature immediately surrounding its bulb. Still other examples, unfortunately, can often be found in graduate science education, where far too many students learn *how* to design experiments, analyze data, and report conclusions without acquiring sufficient insight into *why* these methods warrant these conclusions.

Not only do the expressed views of others initiate many of your beliefs, they also serve importantly to enhance or to damp convictions which have arisen in you from other sources. Suppose, for example, you are walking with a companion when you notice a mutual acquaintance across the street. If, when you suggest “Let’s ask John over there if he wants to go with us,” your friend scoffs “John? That’s not John, that’s my roommate,” you would suddenly feel shaken by considerable doubt that you had really seen John over there after all. Conversely, had you caught a glimpse of what seemed to be John but felt too unsure of this to mention it, your friend’s exclamation “Hey, there’s John!” would greatly strengthen your own opinion to this effect. In similar vein, when I am doing mathematical/logical research I never completely trust the accuracy of my deductions; and when a theorem I seem to have proved agrees with or contains as a special case results already published by others, I am reassured that my theorem is in fact correct.

It is also worth pointing out that the “other person” whose statement that  $p$  is the case produces or enhances your  $p$ -belief may be yourself on a previous occasion. For example, any professional researcher worth his pay makes an immediate, written record of his observations or computational results, and later consults these records when preparing his published report. You have probably not as yet developed any systematic habits of transcribing your present beliefs into messages for your future self, but you may once have kept a diary or reread an old term paper or personal letter relating some event in your then-recent experience. And if there was any discrepancy between your memory of that event and your old written report of it, you will have noticed how strongly self-communications from your past take precedence over your present memory.

Finally—though this may be stretching the “hearsay” category a bit—there are the cases where your reply to the question why you believe proposition  $p$  is something like “Why, everybody knows that!”, even though you can’t recall any specific occasion on which you have heard this. Chances are that you have, in fact, encountered assertions of  $p$  on a number of past occasions, which is why I am including this case under “hearsay”; but the main point now is that sheer



*familiarity* with the *p* idea can push you to higher and higher levels of belief in it. To illustrate, suppose that you repeatedly hear a certain rumor. If your intellectual discipline is no better than average, there is an excellent chance that even if your various confidants have all made clear that the story is dubious, you will eventually come to regard it as the gospel truth. Similarly (and this happens in scientific work as well as in everyday life), you may take a certain generalization or explanation for granted simply because you have never really stopped to think—i.e., never actively contemplated in the foreground of your attention—what alternative hypotheses might also be consistent with the available evidence; whereas once a heretofore unrecognized alternative becomes familiar to you *as* a possibility, your original conviction recedes in strength to make room in your worldview for this newcomer. And if you become so intrigued with the latter that you dwell upon it to the virtual exclusion of attention to your original belief, you may eventually begin to take this hypothesis for granted even though no additional evidence favors it over your earlier view.

How strongly *should* you hold beliefs acquired through “hearsay”? The everyday connotations of this term say *not much*, and this is as good a summary appraisal as any. Even so, particular instances of hearsay cannot always be dismissed that quickly, for life is too brief and the practical range of your first-hand experience far too restricted for you to acquire from non-hearsay sources all the beliefs you need even for personal survival much less for a satisfying intellectual life. The proper way for your beliefs to be influenced by the assertions of others is for you to treat the fact that so-and-so claimed such-and-such in this-and-that a way under these-and-those circumstances simply as *evidence* which has some predictive relevance to the truth of the proposition so asserted, but whose weight *as* evidence is an additional judgment for you to make.<sup>18</sup> To manage this, you need to train yourself to be *aware* whenever an opinion smites you from without and to make a conscious assessment of its merit, if any. The standards for this appraisal must, of course, be your own; otherwise, you are merely judging hearsay in terms of hearsay. But it won’t hurt to remind you of the main factors which your assessment should take into account.

In the first place, when you are informed that *p* is the case, who is the authority responsible for issuing this claim? Optimally, this should be someone you have personally observed in the act of assertion. In practice, your knowledge of the authority is often indirect, as when a friend or newspaper passes on a remark attributed to someone else, or when your firsthand contact is only with a written document to which the alleged author’s name is attached; in such cases, be sure

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<sup>18</sup>Technical note; That is, hearsay or hearsay-based memory ought not to be an *immediate* source of belief, but should have its effect on belief only indirectly through observation and inference, i.e., observation that an allegation has been made and inference from the context of its utterance to the likelihood of its truth.

to consider the possibility that the statement which reached you may not be what was in fact said by the person whom you think said it. (Quotations or paraphrases of remarks made by others are notoriously inaccurate, not excluding those found in news reports, and what editor's alterations and typesetter's errors can do to an author's material between the time it leaves his hands and its appearance in print is often too gruesome to describe within earshot of children.<sup>19</sup> Sometimes, as with maps and encyclopedias, the identifiable authority behind a published assertion is only an organization rather than a particular person. But organization or individual, unless you can trace the assertion to an identifiable authorizing authority of some sort it belongs for you in the same credibility category as rumor and folklore—possible, but not bloody likely.

Secondly, before you believe  $p$  because Jon Smyth says that  $p$  is the case, ask yourself what reasons you have for accepting Smyth's word about this. Even assuming that Smyth is not given to deliberate deceit—an assumption by no means always justified—is  $p$  the kind of proposition which Smyth is *able* to be knowledgeable about? Does he claim to have personally *observed*  $p$ —and if so, can his observational reports be trusted? (People have claimed to witness all sorts of strange things, flying saucers and their traces being most prevalent of late,<sup>20</sup> and if you sometimes mistrust even your own perceptual beliefs, why should the secondhand observations of someone else seem any more credible to you?) And if Smyth didn't arrive at his  $p$ -belief observation, how then *did* he acquire it—does he describe his method and do you concur that it ought to yield sound conclusions, or are you just presuming that he surely wouldn't believe  $p$  without good reason? It helps in such a case to be assured that Smyth is an accomplished member of a profession which specializes in learning things like  $p$ —but this is relevant only insofar as this profession does, in fact, have ways of finding out about such things, and for you to have justified faith that this is you need more than just the profession's own assurances that its professed achievements are for real. After all, you remain dubious that astrologers have means to foretell a person's future from his horoscope even though this is their professional specialty. Why, then, should you be more confident that geologists can tell where ice sheets once covered the earth, that physicists can determine how hot it is in the center of the sun (have you ever seen a thermometer which reads that high?), or that physicians can detect all sorts of intimate things about a person's health by performing rites with a drop of his blood. (*I* have grounds other than hearsay for trusting geology, physics,

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<sup>19</sup>This is why the more responsible professional journals and publishing houses usually allow their authors an opportunity to inspect and correct printer's proofs before press run.

<sup>20</sup>It is easy to shrug off claims of UFOs [Unidentified Flying Objects] seen at great distances, but what is one to think of close, prolonged observations of such things reported by persons who appear sincere and responsible (see, e.g., Furth, 1966.) To accept such "eyewitness" reports without substantial reservations about their accuracy, however, is just as irresponsible as to feel dogmatically certain that there is nothing more to them than hallucination, fantasy, or hoax.

and medicine more than astrology, but whether *you* do is another question.) And of course no matter how respectable Symth's credentials may be for asserting  $p$ , there is always a very real possibility that he has either made an error in the argument by which he inferred  $p$  or, by an unhappy choice of words, has said something rather different from what he wanted to say. (Just how prevalent these phenomena actually are, you will probably not be fully able to appreciate until you yourself assume the "authority" role.)

Finally, even if your faith in the authority behind a given proclamation is devout and unswerving, *are you sure that you really understand what was said?* Consider, for example, the following two quotations:

*Theorem 2.* The canonical factors and canonical correlations between two sets of variables  $X$  and  $Y$  are determined wholly by the spaces  $S_X$  and  $S_Y$  spanned by sets  $X$  and  $Y$ , respectively." (Rozeboom, 1965, p. 64)

"Love in all its subtleties is nothing more, and nothing less, than the more or less direct trace marked on the heart of the element by the psychical convergence of the universe upon itself. This, if I am not mistaken, is the ray of light which will help us to see more clearly around us," (Chardin, 1955, p. 265.)

I place the full weight of my own authority behind the first of these, and while I cannot vouch for the second, it was issued in all seriousness by a biologist/philosopher highly respected in some quarters. Yet how strongly can you believe these propositions—not how far is it *reasonable* for you to do so, but how intensely are you *able* to feel conviction in either case? For belief in a proposition cannot be achieved just by eager mouthing of its verbal vehicle in a receptive frame of mine. Belief requires first of all *understanding*, a clear grasp of what the sentence conveying the belief *means*. And if, as I rather suspect, you find the meanings of these two quotations somewhat elusive, then neither can you *accept* them, even hesitantly, as a basis for inference and action. This need for understanding clamps an importantly restrictive upper bound on the extent to which you can acquire your beliefs from others, no matter how sagacious may be the Great Men at whose feet you sit. To be sure, you can *learn* to understand the concepts of others. But the very act of doing so will destroy your capacity to be an unresisting receptacle for the views. For you do not fully grasp a concept's meaning until you are able to reason, clearly and effectively, about propositions which contain it; and by the time you reach this level of sophistication, such a proposition asserted by another is likely either to claim your assent on grounds other than hearsay (e.g., the *Theorem* just quoted should be evident to anyone who comprehends its meaning without need

for my endorsement) or to appear dubious no matter how prestigious its author may be.

## Desire

As you are surely aware, there lurks within each of us a tendency for our desire that something be or not be the case to bias the strength of our belief that it *is* the case. Whether this is merely a manifestation of familiarity—for what we dread or yearn for tends to fill our thoughts and loom increasingly large in plausibility—or whether wants have a direct effect upon beliefs is unclear. But whatever the detailed nature of this influence, it is so obviously unwarranted as a source of belief that you wish to keep the amplitude of its bias in your judgments as small as you can. Mostly, the method of control is just to be consciously aware of what difference *p*'s being or not being the case makes for your joy in life and to include a suitable allowance for this when you appraise the likelihood of *p*. However, detecting the power with which your desires press upon your judgments is not always so easy to do, for you may value a possible state of affairs *p* from motives much subtler than cupidity, fear, or lust. For example, if *p* is accepted doctrine within a social community to which you have emotional ties—e.g., your family, your church, your profession—calling *p* into question may well jeopardize your standing in that group. Or you may have made plans, taken actions, or sweated out psychological adjustments in anticipation of *p* which will expose you to hurt and embarrassment if *p* turns out to be not the case after all (Cf. Festinger, 1956). Or—and this is especially insidious for intellectuals—you may have organized your beliefs by a system of tidy regularities under which *p* is what ought to be, whereas doubting *p* would throw your comprehension of the world into disarray or at least blotch its simplicity with an ominous anomaly. Even if doubting *p* is no threat to your intellectual security, or a set of propositions which entail it may possess a certain rhythm, symmetry, or elegance lacking in its alternatives, so that *p*'s being the case is esthetically appealing to you. All these and many more like them prejudice your beliefs (not excluding observations) whenever you relax your guard against them, especially if you are smugly sure that *your* reasoning is free of such contaminants.

## Intuition

This is not so much a distinct type of belief-determinant as it is a label for you to use when you can't tell where your ideas come from. Occasionally, perhaps frequently, you are struck by hunches, surmises, or intriguing possibilities which seem plausible enough to be taken seriously even though you can't say why. In such an instance, when proposition *p* just somehow *seems* right to you even though it is not obviously true by definition nor, so far as you are aware, have you observed,

inferred, or been told that  $p$  is the case, we say that your  $p$ -belief is *intuitive*.<sup>21</sup>

There exists a wide spectrum of opinion about the intellectual respectability of intuitive beliefs, ranging from mystic/humanistic types for whom intuition is a source of wisdom far higher than the superficialities of observation and reason, to radical empiricists who profess scorn for any beliefs beyond the observational and abhor intuition as original sin. Although I confess a certain sympathy for the latter view when the intuitions in question approach unshakable conviction, neither of these extreme attitudes is defensible. On the one hand, while it is logically possible—just barely—that intuitions are the direct whisperings of God or the workings of some occult cognitive faculty through which we have transcendental access to the innerness of things, I have no reason whatsoever to think that my own intuitions are anything but perfectly ordinary beliefs whose perfectly ordinary sources happen to elude introspection, nor has anyone else ever given me cause to suspect that he has intuitional resources which I lack. But on the other hand, the grounds of your intuitions do not lose whatever validity they would otherwise possess merely by virtue of your failing to recognize what they are. It is possible that you believe  $p$  “intuitively” because you subconsciously sense  $p$ ’s inferential support by other propositions you accept, or because you formerly observed or were authoritatively told that  $p$  was the case even though you don’t now remember this. Thus when you intuit  $p$  you may have a perfectly good reason for feeling considerable confidence in  $p$ . But then again you may not; for motivational factors, unevaluated hearsay, and other disreputable belief influences, like guests at a masquerade, are most uninhibited when incognito.

What is foolish about taking intuitions too seriously is that they tend, first of all, to be imprecise and unstable, presenting themselves not so much as a definite proposition as a shifty feeling of impending discovery, a glimpse of truth through veils which turn opaque before the image can be fixated; while those which are firm enough to be assessed against later evidence turn out in a high proportion of cases to be false. The trouble with intuition, therefore, is just that it is usually wrong. But this by no means implies that intuitions should be ignored, for there always remains a small but appreciable likelihood that a given intuition is in fact correct, and an even better chance that it is at least partially or approximately right in vital respects. So as long as you regard your intuitions not as infallible truth but merely provocative possibilities still wanting to be cleansed of their inchoateness, criticized as you would test the claims of a brilliant but erratic younger brother, and freely emended as needed, you cannot afford *not* to give them a sympathetic hearing—at least not if you hope to do much creative thinking. For the first thrust of conceptual

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<sup>21</sup> *Technical note:* Sometimes propositions which appear analytically self-evident are also said to be known by “intuition.” However, unless all non-inferred beliefs, including observational ones, are to be counted as intuitive, we should so classify only those self-evident beliefs which the believer fails to recognize as analytic.

innovation is seldom so deliberate and well disciplined that it proceeds only through impeccable arguments clearly visible to introspective monitoring. Intuitions are early returns from the outer tendrils of advancing reason, like scattered sightings and local legends reported by the first explorers of an unknown continent. And if these first reports are seldom more than distorted fragments of the truth, no matter: Of overriding importance is that they incite and direct the more systematic penetrations which follow.

## Metabeliefs

You will have noticed that beliefs about beliefs have repeatedly surfaced in our discussion so far. Earlier, I made much of the fact that my belief strengths are never in excess or deficit of what I believe they *should* be, and just now I have been proffering judgments about the general credibility of beliefs in various categories of their origin. I have even slanted my descriptions (admittedly crude ones) of these categories to emphasize not so much the actual causes of your belief as the phenomenal cues by which you distinguish among them. The reason for this emphasis is that as a person's intellect grows in power and sophistication, metabeliefs exert an increasingly dominant control over the forces which shape his thinking, especially metabeliefs concerning the intensities of conviction which are appropriate for beliefs of various origins.

There are two important ways in which your metabeliefs about warranted belief tend to modulate your reasoning. The first, which may be called "extrinsic control" is that if you sincerely believe (a) that beliefs arising from source  $S$  should be believed with strength  $t$ , while on a particular occasion you also think (b) that your belief in proposition  $p$  arises from source  $S$ , then, if source  $S$  (or whatever is in fact producing your  $p$ -belief) would by itself cause you to believe  $p$  at a strength  $t'$  different from  $t$ , metabeliefs (a) and (b) interact with the other determinants of your  $p$ -belief to drive its strength away from  $t'$  toward  $t$ . (How close to the supposedly ideal strength  $t$  this brings your  $p$ -belief depends on how strongly you hold these metabeliefs. And secondly, by "intrinsic control," repeated experiences wherein your beliefs arising from source  $S$  are driven toward intensity  $t$  by the extrinsic process just described may eventually train you to feel conviction-level  $t$  in such beliefs without further need for metabelief monitoring. For example, suppose that you have learned from an eminent authority on logic that any proposition logically implies any other which stands in a given relation  $R$  to it, and hence that whenever you think one proposition stands in relation  $R$  to another, the latter is at least as believable as the former. Then even if  $R$  is not an inference pattern for you, this metabelief coupled with your belief in a proposition  $p$  and your observation that another proposition  $q$  is  $R$ -related to  $p$  will tend to convince you of  $q$  as well. (Extrinsic control.) After sufficient experience with such metabelief-

guided reasoning, however, you may eventually begin to *feel* the inferential force of pattern  $R$ —i.e., your awareness that proposition  $q$  is  $R$ -related to proposition  $p$  becomes in itself a sufficient condition for the credence you give  $p$  to flow into  $q$ . (Intrinsic control.) Another example: Suppose that you uncritically believe everything you read in seemingly reputable textbooks, so that now, having just read my appraisal of “hearsay,” you find yourself also convinced that you should feel considerable doubt about most of the beliefs you acquire from others. If you recall then this precept whenever you read someone else’s proclamations, it will dampen the confidence with which you would otherwise accept these claims until finally you will come to be sceptical about what you read without need for such prompting.

To be sure, the impact of metabeliefs on real-life reasoning is not nearly so crisp and clean as the present simplistic account suggests, if only because the concepts now available to us for articulating beliefs about beliefs are still too amorphous for such propositions to be anything but vague and impressionistic. For example, while I spoke bravely of “belief strength  $t$ ” a moment ago, in practice we still lack anything resembling a precise scale of belief-intensities on which to designate a particular level of conviction. (In this respect belief-strength is more like handsomeness than like height: Whereas you can easily describe your exact height, your conceptual resources are inadequate to identify just how handsome you are.) Within quite recent years, technical philosophy of science has begun to develop theories of credibility in which “appropriate strength of belief” is conceived as a probability or probability-like quantity between zero and unity reflecting the likelihood that the belief in question is correct. However, we are still an enormously long way from being able to apply this scale to beliefs which people actually have, nor is it at all certain that likelihood-of-truth is the only important dimension on which the believability of propositions needs to be assessed.<sup>22</sup> Just the same, metabeliefs are no exception to the general rule that a person’s beliefs need not be precise, articulate, and at ready access to introspective scrutiny in order to exert powerful control over his thoughts and behavior. Experienced thinkers do, in fact, often develop considerable intuitive sophistication at appraising the sources and expected reliabilities of their beliefs, even if the present state of the art does not permit clear conceptualization or ready verbalizing of these judgments; and their relative obscurity notwithstanding, such metabeliefs do, in fact, profoundly modulate one’s reasoning more or less in the fashion idealistically sketched here.

If the spirit of critical judgment which underlies our present review of belief-processes has become operational in your own thinking, you should be wondering

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<sup>22</sup> *Technical note:* Not only is there a good chance that we shall eventually be forced to abandon thinking of a proposition’s truth as a simple all-or-none affair, thus complicating the likelihood-of-truth interpretation of credibility, the theory of knowledge will undoubtedly also have to recognize a belief’s clarity and precision as further significant ingredients of its epistemological merit.

about now where metabeliefs themselves come from and how trustworthy they are. The *normative* force of metabeliefs—i.e., what is expressed by “Beliefs arising from a source of type *S* *should* be held at conviction-level *t*”—appears to derive mainly from generalizations about belief accuracy, i.e., metabeliefs roughly of form “Beliefs arising from sources of type *S* are correct about  $x\%$  of the time,” where the larger  $x$  the stronger is the level *t* of conviction warranted for beliefs of source-type *S*. But this only raises a further problem: Excluding hearsay (which personally I don’t trust worth a damn on this sort of matter, though I’m more than willing to pass on my conclusions to you), it would seem that the only way I can estimate the truth rate of my source-*S* beliefs is by introspecting upon their strengths and noting how they are distributed along the continuum from conviction to disbelief—for insomuch as the correctness of my belief in a proposition *p* is determined by whether or not *p* is the case, my final judgment about the latter, beyond which I have no court of higher appeal, is given simply by how strongly I believe *p*. And if my opinion about the accuracy of my source-*S* beliefs merely reflects the overall degree of assurance that sources of type *S* do, in fact, inspire in me, how can this meta-belief serve in any meaningful way to monitor the strength-of my source-*S* beliefs? The answer lies in the fact that a given belief often draws its strength from not just one but a plurality of independent sources of same or different types, and these may or may not concur with one another. Thus when you observe or someone else reports that *p* is the case, additional witnesses present may agree—or may disagree—that *p* is so. Or what you seem to be observing (say, an elephant walking unsupported five feet above the ground during a circus performance) may or may not be compatible with the properties you have learned to expect of things in these circumstances or with natural laws you believe are inviolable. Or your 1st-degree memory of some past event may be confirmed—or disconfirmed—by an entry in your diary. Or your 2nd-degree recollection of having proved a certain theorem may be confirmed by working through the proof again—or disconfirmed by discovering a disproof of it. Or the conclusions you reach from a set of premises by a particular inference pattern *R* which seems perfectly reasonable to you may or may not be supported by the conclusions you obtain from those same premises by certain other inference patterns which also carry considerable conviction in you; while other persons whose judgments you respect may or may not consider an *R*-patterned argument to have merit. The effect of such concatenations is twofold: (1) With respect to individual beliefs, to the extent that the various sources of your opinion about a proposition *p* corroborate one another in their support (or their discrediting) of *p*, the consensus will cause you to believe *p* more strongly than any one of these sources would induce alone. Contrarily, if your belief-determinants are in serious disagreement over *p*, you will remain highly uncertain about *p* regardless of how persuasive these conflicting sources would be individually. (2) Moreover, when your *p*-belief is multi-determined, your recollecting how strongly one of these sources acting alone formerly led you to believe *p*, or your analytic abstracting from



your present belief-strength the level of  $p$ -belief a single contributor would invoke by itself, allows you to observe how closely the strength of belief in  $p$  urged by a particular source agrees with the final composite. In this way, you can build up generalizations concerning how closely the level of conviction generally sustained in you by sources of type  $S$  corresponds to the likelihood of a belief so aroused being judged correct rather than false by your later consensus of evidence from a multiplicity of sources.

Once again, I am here giving you a vastly oversimplified and wistfully idealized account of belief processes which in fact are murky and largely preconscious even in the most sophisticated of thinkers—more accurate than this I cannot become without getting into a snarl of technical problems in psychophilosophy at least an order of magnitude more difficult than any yet dealt with by philosophical or psychological theories of cognition. But regardless of details, it seems reasonably safe to say that metabeliefs evolve out of the interplay among convergent channels of thinking, the flow through which is enhanced by consistency and damped by conflict.

## Scientific Method

### On judging the rationality of others

By now you should have begun to appreciate, if you hadn't before, the enormously intricate multi-leveled complexity of your thinking, and to feel a quickened resolve henceforth to keep it under a more vigilant metabelief surveillance. You can also now grasp more clearly than before the nature of your personal responsibility for what you believe even though, as noted earlier, believing or doubting is not a voluntary action at your command. For while you cannot simply *choose*, e.g., to have one observational belief rather than another, or to be convinced of an argument's conclusion by your awareness of its inferential relation to plausible premises, or to be sceptical about things you are told, etc., you *can* voluntarily take steps to bring about the sort of events which extremetize your belief in a given proposition. You can sometimes contrive to be in position to observe what you want to know. Before you perceive the inferential relatedness of propositions you may well have to expend considerable concentration and perseverance at searching out their logical connections. Reference materials seldom confront you unless you actively seek them, while examining your authority's credentials and checking his opinion against those of his peers often taxes your dedication even more. And above all, metabeliefs are not likely to monitor your thinking to the degree they should unless you conscientiously strive to identify your belief-sources and ponder upon the strengths of conviction they seem to warrant. Moreover, you will note

that only in the case of hearsay is there any meaningful sense in which you could hold someone else responsible for your beliefs; and now that you appreciate how modest is the degree to which you can trust what others say (or what you think they say), you can no longer acquire much conviction from hearsay alone. So henceforth the only beliefs you are entitled to hold strongly are the ones which you have sweated out on your own, by your own first-hand observations or memories thereof and your own concentrated reasoning in accord with inference patterns which feel convincing to *you*, regardless of the repute—good, bad, or never thought of—you may think these have with your alleged intellectual superiors. If your conclusions so derived agree with the judgments of others, all the better; and of course your own wisdom never warrants such smug confidence that an encounter with manifestly sincere views opposed to yours does not call for a thorough review of the evidence on both sides; but a judgment which you cannot defend, if needs be, in the teeth of jeers, disregard, and paternalistic assurances that you are wrong, is a pretty pathetic excuse for intelligent belief.

It is evident from the tone of these remarks that I have some fairly stern views on how you should conduct your thinking, and hence that my conception of what “scientific method” is for *me*—namely, anything which helps to alleviate the uncertainty of my beliefs—may not remain so liberal when I apply this phrase to others. From my perspective, scientific method for *you* is restricted to operations which help to drive your beliefs toward *justified extremes*, so that I consider your opinion and the process by which you arrived at it to be “scientific” only insofar as I agree that the strength of your belief is at the level it should be, considering your grounds for it. There is little to be gained here from a detailed inventory of my standards, such as they are, for assessing your rationality. Instead, after showing *why* this would not be profitable (it involves issues of considerable significance), I shall close in upon the real life determinants of my respect for your beliefs and work these into an importantly practical definition of “scientific method.”

At first thought, it might seem that the strength at which your grounds for a proposition *p* justify your believing it is, according to my standards, simply the degree of *p*-belief which I think those grounds would arouse in me. But while I suspect (on rather shaky evidence) that this is the implicit outlook of many persons (including, unfortunately, some professional scientists), mine is somewhat more complex than this. Consider the following hypothetical belief-episodes:

(a) Your brother-in-law was tragically blinded not long ago. Today, you bring him a new hi-fi record which you think he will enjoy; and as he handles the record jacket he muses, “I wonder why they made this such a ghastly shade of purple?” Amazed—for the record jacket is indeed colored as he says—you ask how he can tell this. He replies, “Just as I always have. When I run my fingers over it, I feel that it is

purple.”

(b) You are a war reporter accompanying a reconnaissance flight over enemy-held jungle. The Sergeant, an old pro at this, suddenly grasps your arm. “That’s a battalion-sized bivouac,” he points, “and over there are at least three rocket launchers.” All you can see in the places indicated are some vague smears, and at first you wonder if he is putting you on. But when he radios the same report back to base, you conclude that he really believes what he says.

(c) As you reach for an apple from the pile on the kitchen table, your mother warns you, “Don’t take that one, it’s wormy.” You choose that one anyway and sure enough, as your mother prophesied, it turns out to be wormy. When you ask her how she knew this, she replies that she inferred it from her observation that the apple had brown spots on it. You don’t see any connection between brown spots and worminess, but being fresh out of a logic course where you learned about enthymemes,<sup>23</sup> you assume that she really inferred her belief in the apple’s worminess from her observation of its appearance, together with her belief that all apples with brown spots are wormy, by way of the deductively valid inference pattern

$$R_1: \begin{array}{l} \text{All } X\text{s are } y \\ \hline i \text{ is a(n) } x \\ \hline i \text{ is } y \end{array}$$

But when you chide her about not describing her reasoning in full, she denies having any idea of what proportion of brown-spotted apples are wormy; all she can say is that when she sees brown spots on an apple, she just feels sure that it is wormy. That is, she infers the latter from the former by inference pattern

$$R_2: \begin{array}{l} \textit{i is a brown-spotted apple} \\ \hline \textit{i is wormy} \end{array}$$

which you will never find approved in any logic text even though, inasmuch as it is a law of nature (let us suppose) that all brown-spotted apples are wormy, inference pattern  $R_2$  never leads to a false conclusion from a correct premise.

Our problem is now to decide whether your brother-in-law, the Sergeant, and your mother are *justified* in feeling sure that the record cover is purple, that a

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<sup>23</sup>Your dictionary has it. Look it up.

battalion-sized bivouac is down there, and that this apple is wormy, respectively by the grounds they have for these beliefs. Let's start with your brother-in-law. Clearly misfortune has unhinged his sanity, for it is absurd to suggest that he can discern the colors of things by *touching* them—agreed? Writing off your brother-in-law as a crackpot is the obvious move in this case, for *our* tactile sensations yours and mine—never convey even a hint of an object's color, much less warranting any strong conviction about this, and we can always find some way to explain how your brother-in-law managed to name the color correctly in this instance (e.g., a lucky guess, or perhaps he subconsciously recalled someone else's complaint about this record's cover). Yet I, for one, am not ready to dismiss his claim so quickly. If further investigation shows no relation between his alleged tactile perceptions of color and the colors *I* see the test objects as having, I will agree that these color-awarenesses of his are indeed fraudulent. But if his tactile color judgments *are* highly accurate under protracted testing,<sup>24</sup> I will eventually concede that whatever the strange qualities of touch, entirely beyond my ken, which convey observations of color to him, they fully justify the confidence he feels in these perceptions.

Since we have assumed for sake of the example that your brother-in-law's tactile experience contains extra dimensions which you and I lack (i.e., in effect an extra sense), the Sergeant's case differs enough from this to pose a separate problem. For when you or I look at the same stretch of jungle as does the Sergeant, at the same time, same distance, same angle of regard, and with visual receptors which function (let us say) in identical fashion as his, and yet he confidently sees a bivouac where all that you or I can make out is a few faint smears which could perhaps be a bivouac but might just as well be a number of other things, the same sensory vehicle conveys a very different intensity of bivouac-belief to him than it does to us. Is he not then trusting his observation far in excess of what is appropriate? My reply—though whether you will say the same I cannot be sure—is that while many persons do indeed appear to be vastly over-confident of their observations' reliability, as evidenced by the frequency with which their observational reports are later disconfirmed, and whereas my own blurred perceptions when viewing a jungle from above have demonstrably feeble accuracy and hence well merit the meager conviction with which they present themselves to me, the Sergeant is entirely right to feel rather sure of the beliefs these same sensations convey to *him* so long as these perceptions are in fact usually veridical. I have good reason to think, both from personal experience and from reputable hearsay, that much of a person's capacity to perceive is *learned*—such learning affecting not merely the accuracy of his observational beliefs but also the concepts which enter into them. If so, it

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<sup>24</sup>This possibility is not so hypothetical as you may think, for several apparently authentic cases of such an ability have, in fact, been recently reported. (See, e.g., Jacobson, Frost, & King, 1966.) Note that there exists no logical reason why colors cannot be felt as well as seen, anymore than our ability to discern shapes by sight prevents us from identifying them by touch as well.

would seem most foolish of me to presume that whenever *I* have not acquired the perceptual habits required to extract a certain kind of information from a given flux of sensory input, no one else is rationally able to do so either.

Finally, what level of conviction is your mother entitled to feel in the conclusions she arrives at by inference pattern  $R_2$ ? I'm not going to tell you my own view this time; I shall merely point out why there is a problem and let you work out your own answer. To give the problem teeth, we stipulate that your mother really and truly did infer the worminess of your apple from its coloration by inference pattern  $R_2$ ; she did not unwittingly reason by pattern  $R_1$  from an unconscious belief (acquired, say, from many years of apple cooking) that all brown-spotted apples are wormy—if you wish, we may suppose that she had never seen nor heard of a brown-spotted apple before. Moreover, the fact that inference pattern  $R_2$  is not deductively valid is not in itself sufficient to stigmatize the conclusion it yields as unjustified by its premises, for otherwise we should not be able to admit the rationality of inductive arguments such as the one which converts belief that all *As* observed so far have been *Bs* into a rather strong expectation that the next *A* to be observed will also be a *B*.<sup>25</sup> Now clearly, not every inference pattern of form

$$R_k: \frac{i \text{ is an } A_k}{i \text{ is a } B_k}$$

in which “ $A_k$ ” and “ $B_k$ ” are arbitrary predicates, can be considered rational, nor would your mother's  $R_2$ -patterned inference from her observation that this apple is brown-spotted to the conclusion that this apple is wormy justify her belief in the latter were it the case that brown-spotted apples are virtually never wormy. But what is wrong with this inference if brown-spotted apples are, in fact, always wormy? Three relevant possibilities arise in this case: (1) Your mother reasons by many inference patterns of form  $R_k$ , regardless of how often  $A_k$ s are  $B_k$ s, including instances where scarcely any  $A_k$ s are  $B_k$ s. (2) She reasons by many patterns of form  $R_k$ , but only when it is a law of nature that all  $A_k$ s are  $B_k$ s. (3)  $R_2$  is the only inference pattern of form  $R_k$  by which she reasons. In case (1), it is fairly simple to argue for the irrationality of your mother's inferences by pattern  $R_2$  (though a nasty problem then arises concerning whether someone else, say of whom (2) is true, could then justifiably reason by  $R_2$ ). In the event of (2), on the other hand, it is rather difficult to see anything defective about your mother's  $R_2$ -patterned

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<sup>25</sup> *Technical note:* Philosophers have, in fact, worried mightily about how inductive inferences can be justified. But most have narrow-sightedly sought to justify induction by finding, in effect, some *deductive* counterpart to it. While there is much for the theory of inference to say about the epistemic character of induction, it cannot undercut the pragmatic fact that you and I *do* find certain patterns of nondemonstrative inference moderately convincing, and that inference theory can find nothing defective in such arguments so long as we do not suppose that the premises of an inductive inference vouchsafe its conclusion beyond all reasonable doubt.

reasoning even though this case would set her apart as a most remarkable person. And finally, if you have decided that (1) vs. (2) makes a difference here, you are in a real bind over what to say in case (3).

There are two morals to be drawn from all this. The first is how difficult it is for me to set forth in precise detail my standards for rationality in person other than myself. Even if I did have these worked out to my complete satisfaction, there would be little point to my publishing them except as a chapter in my autobiography<sup>26</sup> or as a goad to professional debate; for I have little hope (nor for that matter any strong desire) that I could recruit widespread allegiance by others to these particular standards, even as a shared egocentricity. This is not to suggest that further analysis can never someday approach an enlightened consensus on this matter, but it does mean that the fine points of how I think you should think cannot form the basis of a practical definition of “science” or “scientific method.” Secondly—and now I shall be preaching rather than describing the way things are—it ill becomes you to be over dogmatic when judging the soundness of other persons’ beliefs. Once you have begun to meet your metabelief responsibilities for your own thinking, it is entirely appropriate that you question whether the belief of others are altogether what they should be, and that, lacking firm evidence to the contrary, you take the degree to which *you* would believe proposition *p* in circumstances *C* as your best estimate of the *p*-belief strength warranted by these circumstances for Jon Smyth. But never forget there is always an off-chance that Smyth has epistemic resources which you lack, either in degree or in kind (cf. the Sergeant and your brother-in-law, respectively). If Smyth professes to observe things you cannot, never mistrusts his memories or intuitions, or reasons by patterns which make no sense to you, accept his claims with the hard-headed reserve appropriate to your awareness that the world is clogged with fools and cognitive cripples. But always be willing to test the accuracy of Smyth’s beliefs, unreasonable as these appear by your self-standards. And if their reliability does prove to match the level of his confidence in them, be prepared to admit that Smyth has something going for him which you do not yet understand. A hard head and a closed mind are entirely different organs, and if you apply the first while suppressing second you may be able to learn how Smyth does it—perhaps even how to do it yourself.

### Scientific Method: Attitude, not technique

I have heaped so many philosophic obscurities upon what it is to be “scientific” that by now you must despair of finding any life in this concept. Its vitality returns unimpaired, however, when we give it some real work to do.

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<sup>26</sup>Not forthcoming.

Why should I be at all concerned about the epistemic quality of your beliefs? Ignoring the possibility that I might have some emotional hang-up over the prospect that you do not engage in Right Thinking, in the way, e.g., it would disturb me to think that you might be a homosexual or that your nose is crawling with maggots,<sup>27</sup> *all that matters for practical purposes is the extent to which I can trust what you say, and the likelihood that what I can learn from your beliefs is worth my bother to do so.* If I am to treat you as a person with whom I can truly *communicate*, rather than as simply a large, domesticated primate living on the same side of the zoo as myself, hearsay received from you must be worthwhile. Ideally, this requires that for every degree  $d$  of belief, the relative frequency of true propositions among those which you believe at level  $d$  is approximately equal to the probability of truth for which  $d$  is the appropriate intensity of conviction—i.e. that all propositions of which you feel absolutely sure are true, that those of which you are strongly though not completely convinced are for the most part essentially correct, and so on down to where your disbelieving a proposition signifies that it is very likely false. For then my awareness that you believe a proposition  $p$  in degree  $d$  gives me good reason for believing  $p$  in degree  $d$  as well. (More precisely, when I have reasons for believing or disbelieving  $p$  apart from your appraisal, the latter becomes a component, worth conviction-level  $d$  by itself, in the complex of sources determining my  $p$ -belief.) Being realistic, I do not expect your beliefs to achieve this ideal with perfection; but it is also evident to me that some persons come much closer to it than do others, and it is precisely to evaluate you in this respect that I pass judgment on how scientific your thinking is. That is, the cash value of how “scientific” I consider your beliefs to be is, in the main, simply the extent to which I feel justified in adopting your beliefs as my own at least until I can improve upon them through additional evidence.<sup>28</sup>

I said “in the main” just now because there is a further practical aspect of your beliefs which I want to include in my rating of their worth. If I know both that your beliefs are ideally reliable and that you feel absolutely sure of a particular proposition  $p$ , then the truth of  $p$  is completely settled for me and nothing more needs be said. But what if your  $p$ -belief strength is noncommittal uncertainty—is this because the evidence accessible to you does not warrant any firmer conclusion about  $p$ , or is it simply because you have not properly availed yourself of this evidence. (E.g., you may be perplexed over how much interest your auto loan is

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<sup>27</sup>Don't laugh. History teems with religious/political/moral-reform fanatics who have dedicated their lives to cleansing others of evil thoughts

<sup>28</sup>*Technical note:* Of course I don't *voluntarily* adopt your beliefs. Rather, my metabeliefs about your reliability create a condition under which hearsay from you has this effect on me. It should be added that I need not consider all of your beliefs to be equally scientific: You may be much more reliable about some things than about others. Even so, observe that this practical sense of “scientific” is not primarily a one-by-one rating of your individual beliefs but a statistical assessment of broad classes of them.

costing you, even though you know the purchase price, the down payment, and your monthly installments, because you are too ignorant or lazy to figure it out and too passive, timid, or indifferent to ask.) If I am to have any respect for your views on a given matter, I want your *lack* of conviction, when it appears, to mean more than just a lack of effort to extremize your beliefs. Your *doubt* about a proposition  $p$  is “scientific” (rather than mere cognitive incompetence) only insofar as you have made a respectable attempt to make whatever observations, activate whatever memories, consult whatever reference materials, etc., are relevant for determining whether  $p$  is the case, and from there, by all the inference patterns which make sense to you, have done/your damndest to reason out as extreme a conviction about  $p$  as your metabelief standards for sound judgment will condone.

I have now told you all that you need to know, or at least all that I am going to tell you, about what “scientific belief” means to me. It remains only to rake in the practical payoff of all this verbiage, namely, an operationally significant definition of “scientific method.” Since in principle the latter is any route to scientific beliefs, i.e., in your case anything which helps you attain convictions as extreme as reliability will permit, an exhaustive inventory of “scientific method” would have to include as many sublists as there are different propositions to be judged and different persons to judge them. (Thus, “scientific method” for deciding whether Parisian taxi drivers are more aggressive than New York City cabbies includes hustling a research grant and buying a transportation ticket to Paris; while for determining, the product of 135 and 246 it involves hunting up pencil and paper, or blackboard and chalk, and working it out. Also note that which methods are “scientific” for you depends in part on your personal circumstances. E.g., the appropriate travel arrangements for collecting the cabbie-comparison data depend a great deal on where you are located and how ample your grant funds are, while ordinary arithmetic computations do not work for a blind person.<sup>29</sup>) What is usually discussed—and quite rightly so—in the graduate methods courses of specific scientific disciplines are special techniques for coping with a variety of restricted technical problems. The fledgling scientist must master these if he is to achieve expertise his chosen field, but they are just efficient ways to go about answering questions a particular kind, with nothing like the universality expected of “scientific method” in any definitive sense. Regarding technique, then, there is no such thing as Scientific Method; there are merely a great many methods which

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<sup>29</sup>If you think it is absurd to offer such commonplace actions as travel arrangements, grade school arithmetic, and pleas for financial aid as serious examples of Scientific Method, this only shows how mystical a misconception you have of science. Neither should you think there is anything bizarre about evaluating the scientific soundness of a person’s belief about a numerical product, as though this were not the sort of thing one is able to be “scientific” about. It is simple to conceive of ways in which a person’s conviction, say that  $135 \times 246 = 33,210$  might be less than fully rational, e.g., if he is convinced of this because it is the answer he just computed but has never attempted to verify that his computational method yields correct answers.



scientists find helpful in one way or another.

Even so, there are three procedures which I must believe you practice, no matter who you are or what you say, if I am to have much respect for your opinions; which conversely, I am reasonably confident that any belief you acquire under their guidance, at least insofar as you apply them with sincerity and skill, is as reliably extreme as your capabilities permit.<sup>30</sup> These “procedures” are not specific operations to be performed, but are fundamental orienting attitudes which shape the contours of your thinking. These attitudes can be learned, though not overnight nor by passive reading of science texts, and since they come far closer than any other practical procedure to being both necessary and sufficient for the attainment of scientifically sound beliefs, they deserve to be honored—and, more importantly, practiced—as the backbone of “scientific method.” Specifically, the attitudes to which I refer are

- (1) Healthy Scepticism,
- (2) Insistence on Evidence,
- (3) Demand for Clarity.

This threefold listing is largely for expository convenience; actually, they closely interpenetrate one another as but slightly different facets of the outlook known since William James as “tough-mindedness.”

*Healthy scepticism.* You have of course learned from popular folklore that scientists are a pack of Doubting Thomases; and if you have paid attention to my earlier emphases on the fallibility of all belief sources, even your personal observations and especially what you hear from entrenched authority, you see why there is much truth in this legend. A person begins life helplessly dominated by elders incomparably superior to him in wisdom and potency. After years of conditioning to accept without question what he is told by parents, teachers, religious advisers, and *Reader's Digest*, it takes an unusually autonomous intellect to develop on his own the sturdy disrespect for others' convictions appropriate to their fallibility. The first requirement for scientific thinking, then, is learning *how to doubt*. Notice, however, that I said *how to doubt*, not merely to do it any old way. *Irresponsible* scepticism is easy to come by; in fact, intelligent young adults often pass through such a phase before the ravages of their childhood trust in authority are healed over by a maturing capacity for independent thought. But to equate scientific doubt with noncommittal uncertainty—as some writers suggest by calling it “suspension

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<sup>30</sup> *Technical qualification:* If your reliability on a given topic has been demonstrated to my satisfaction, then I will accept your assertions on this matter regardless whether you comply with these procedures. But if I think you do not, it will take exceptionally strong evidence to convince me of your reliability and even then I will regard you not as a *person* with whom I can communicate but only as an oracle machine which in some remarkable fashion appears to work.

of belief—is to ignore the fact that “doubt” includes all degrees of conviction less than complete assurance. To profess a know-nothing rejection of propositions for which the evidence is *near* conclusive, as when tobacco-industry spokesmen argue that since the causal linkage of lung cancer to smoking hasn’t been “proved” (i.e., established beyond all possibility of further emendation) there is no reason to act on this as a virtual certainty, is just as witless as the chanting of Mao’s Thoughts by dedicated Red Chinese. Scientific doubt is believing no more strongly *nor any less* than is warranted by your grounds for belief.

Healthy scepticism is a twofold mode of *habitual* reaction to newly received assertions, the stronger the received confidence the more vigorous the response. The first phase is a prompt, unhesitant labeling of the claim in question as “nonsense” (or whatever earthier expression to that effect you may prefer). For maximal effectiveness, this initial labeling should be forceful and automatic. Remember, this is not a final judgment, but only the reflexive vigilance of a well-trained guard against careless credulity. It is simply the natural expression of a deep, pervasive, awareness that the overwhelming bulk of what people believe is more or less in error. The second phase of the sceptical reaction, without which the first is empty arrogance, is then to set about *showing* that this claim is indeed nonsense. For you have now staked out an intellectual commitment, if only a provisional one, and while the odds are most unsportingly in your favor, you must now put up or shut up.

There are two ways to back your (provisional) contention that an assertion  $p$  is unworthy of serious allegiance; on the one hand to observe that the grounds for accepting  $p$  confer at best only feeble support, and on the other to find good reasons for disbelieving  $p$ . A two-fisted sceptic punches with both. The first is simply active, suspicious inventory of  $p$ ’s credentials: Have you been assured of  $p$  by your teacher, your textbook, your preacher, your senator, or some other prestigious authority? If so, how accurate is this authority and what reasons have you for thinking so? Is  $p$  the sort of thing about which he is able to be knowledgeable, and where do you get your opinion about this? If  $p$  has been presented as a reasoned conclusion, how plausible are the argument’s premises and is the pattern of inference a convincing one? The point of this inquisition is not to deny  $p$  the level of acceptance to which it is entitled, but to insure that you take a long, cold look the grounds for believing  $p$  and give them no more credit than they deserve—in short, to make sure that your metabelief norms for sound judgment are fully operative on this occasion. However, merely disparaging an assertion’s basis still leaves its truth an open possibility; to justify the extremity of your initial response to the  $p$ -declaration you must also find positive support for the belief that  $p$  is false. And while the details of doing this depend on the proposition’s content, there is one universally applicable way to go about it which is so important for disciplined thinking that I have said this much about “healthy

scepticism” mainly to bring it to your attention.

The method to which I refer is based on the fact that if propositions  $p$  and  $q$  are so related that  $p$  cannot be true unless  $q$  is also true, then, no matter what grounds you may have for your beliefs, they cannot justify your believing  $p$  more strongly than  $q$ . That is, if  $p$  entails  $q$ ,  $p$  is no more plausible than is  $q$ . To find convincing grounds for disbelieving  $p$ , then, it suffices to tease out some consequence of  $p$  which is almost certainly false. For example, if during your teens your exasperated mother once complained, “You’re *never* on time for meals!”, and you wise-mouthed back, “That’s not true; don’t you remember that time two years ago?” you may deservedly have been punished for insolence but your argument was impeccable—if you had ever once been on time for a meal, this was enough to refute your moth accusation. Or if your English professor returns an overly diffuse composition to you with the comment, “An essay can always be improved by shortening it,” you might point out that if this maxim were true the best length for an essay would always be no words at all. Or if a friend, swatting at a persistent mosquito, snarls “That bastard’s really trying to get me,” you should be alert enough to recognize (even if you feel no need to amend your friend’s statement out loud) that *trying* to accomplish something involves having a cognitive conception of the to-be-striven-for goal and is thus presumably far beyond the primitive mental capacity of an insect.<sup>31</sup> And if your senator avows that his heart is overflowing with gratitude for his supporters’ loyalty, it is appropriate to ask where the run-off is draining. When searching out the untenable consequences of an assertion  $p$ , don’t concentrate on what is obvious and sensible; look for strange, extremistic, absurd implications which are too outrageous to cross the mind of a conventional thinker—the sort of thing which, when pointed out to  $p$ ’s proponent, will cause him to protest indignantly “Well, of course I didn’t mean *that!*” But if *that* does follow from  $p$ , then he shouldn’t have claimed  $p$  in the first place. To be sure, through exaggeration, metaphor, and plain old-fashioned verbal bumbling, people often fail to say exactly what they mean. Thus your mother’s remark was merely an emphatic way to point out the high frequency with which you had recently been late for meals, and the senator doesn’t *really* mean that his heart is leaking gratitude-fluid. No harm is done by such hyperbole so long as all parties involved understand that it is not to be taken literally. But of course if you can show that the person asserting  $p$  did not really mean what he said, then your scornful dismissal of his claim stands fully vindicated. As a professional thinker or even as skillful amateur, it is your responsibility to recognize the full implications of a

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<sup>31</sup>Notice that I do not suggest any falsifying implications of the term “bastard” here, even though its primary usage applies only to humans. This is clearly not the sense intended, and while it is valuable practice to see how many meanings you can read into an utterance, it is dishonest and irresponsible—except as a joke—to fault another person’s statements by interpreting their ambiguities in their most inappropriate senses.

statement's literal meaning regardless of how non-literally you suspect it has been intended. Often a person who asserts a proposition  $p$  remains unaware that  $p$  isn't quite what he wanted to say until its untenable consequences are pointed out to him. And if, knowingly or not, the speaker does not mean what he says, then what *does* he mean? Analogy may be suggestive, hyperbole emphatic, and metaphor poetically evocative, but if the speaker indicate that you are not supposed to take his statement literally then neither has he told you what his belief actually is. And if he is unable to convey the latter except by evasive rhetoric, you can feel pretty sure that what he believes isn't very clear him, either.

You will observe that while the "healthy scepticism" described here is a sequence of actions, they are all actions which can be run off in the privacy of your mind. Prudence urges that for the most part they remain so. Scepticism is an extended process wherein the degree to which you accept or reject a proposition  $p$  may well undergo considerable oscillation before closing in on a final judgment, and to avoid all-around embarrassment it is better to abstain from overly vehement public criticism of  $p$  until you are pretty sure that you can make your condemnation stick. Never forget that a well-rounded sceptic reacts as critically to his own ideas as to external hearsay; and once it is obvious to you that received assertion  $p$  is indeed nonsense, your conviction that  $p$  is false then becomes the new target of your sceptical appraisal. Do the arguments and evidence which seemed so damaging to  $p$  a moment ago still feel convincing now that you have probingly reviewed them for flaws? And, though you now see the error in your refutation of  $p$ , might you not have erred in thinking this error was all that crucial? And so back and forth, your conclusions at any one moment providing the dogma challenged by you the next, until finally you attain a stable  $p$ -belief (or disbelief) which resists further counter-argument because you have already considered and reconsidered all the relevant angles.

Did I hear you mutter that this style of scepticism sounds far too demanding, too tormented, too tedious and time-consuming for you to be bothered with it? Well, whatever gave you the notion that effective thinking was easy? Any clod can mouth opinion or read a book on scientific method, just as the ability to watch a prizefight telecast comes naturally to most of us. But the fighters themselves sweat, suffer and bleed if they practice their profession with any proficiency; and the effort required to attain that competence includes 20 miles of roadwork every morning. To hope that the acquisition and use of rationality at a comparable level of technical excellence does not require comparable quantities of persistence, strain, and old-fashioned grit is just wishful thinking.

Finally, before you plead that you don't know how to evaluate assertions in this incisively sceptical fashion, or to sustain a prolonged systematically appraisal of your own beliefs, notice that I have characterized "healthy scepticism" not as

the adroit accomplishment of these things but only as the earnest endeavor to do them. No matter how meager may be your present skill at critical analysis, you are perfectly capable of *trying* to be suspicious of what you hear, and to confirm or allay your suspicions by the lines of inquiry described above. And if you succeed at first only in becoming confused and insecure, console yourself with the thought that therein lies practice and that through practice and practice alone comes first success and finally virtuosity.

[To be continued]

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