

# MODES OF JUSTIFYING KNOWLEDGE CLAIMS

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**-An incomplete preliminary draft –**

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## **TABLE OF CONTENTS**

### **1. Knowledge, Justification, and Critical Thinking**

- 1.1. Knowledge and Knowledge Claims*
- 1.2. Justification: Defending and Refuting Knowledge Claims*
- 1.3. Criteria of Evaluation*

### **2. Singular Observations, Generalizations, and Theories**

#### **3. Justifying Singular Observations**

- 3.1. Direct Sensory Experience*
- 3.2. Mediated Sensory Perception: Manmade Sensing Instruments*

#### **4. Justifying Generalizations**

- 4.1. Inductive Generalization*
- 4.2. Generalization through anecdotal evidence*
- 4.3. Inspired Leaps*

#### **5. Justifying Theories and Theoretical Interpretations**

- 5.1. Fit with observational clues*
- 5.2. Choosing between Alternatives*
- 5.3. Conflicting Evidence*
- 5.4. Converging Evidence and Objectivity*

#### **6. Knowledge as Provisional Truth**

#### **7. Logic and Mathematics: Justification through Proof**

#### **8. Explicit and Intuitive Justification**

#### **7. Socially Constructed Pool of Knowledge**

- 7.1. Personal and Socially Transmitted Knowledge*
- 7.2. Reported Sensory Experience and Measurements*
- 7.3. Credibility of the Source*
- 7.4. Infallibility of the source*
- 7.5. Tradition*

#### **8. Refuting Knowledge Claims**

#### **9. Criteria of Justification in the Sciences**

#### **10. Incommensurability: Debates that cannot be settled**

#### **Appendix: Knowledge, prejudice, illusion and superstition**

# Modes of Justifying Knowledge Claims

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## 1. Knowledge, Justification, and Critical Thinking

### 1.1. Knowledge and Beliefs

Human beings entertain many types of beliefs. I believe, for instance, that the Earth goes around the Sun, that telling lies is bad, and that W.B. Yeats is a greater poet than Alfred Tennyson. Some of these beliefs are beliefs about the truth or falsity of propositions, while others are about the moral right and wrong of actions or behaviour, the beauty, significance, value etc. of ideas, things, or people, and so on. When I assert that the Earth goes around the Sun, what I mean is “I believe that the proposition ‘The Earth goes around the Sun’ is true.” When I assert that it is wrong to tell lies, what I mean is “I believe that the action of telling lies is morally wrong.”

We will refer to beliefs about the truth or falsity of propositions as epistemic beliefs because they are tied up with what we consider to be knowledge. Epistemic beliefs are to be distinguished from ethical beliefs (beliefs about the moral right and wrong of actions or behaviour), aesthetic beliefs (beauty of ideas, things or people) and so on. In what follows, we will be concerned only with epistemic beliefs. The only reason for mentioning other types of beliefs is to place our inquiry in a broad context, and make clear what we are going to explore.

### 1.2. Knowledge and Knowledge Claims

What we call **knowledge** is collection of propositions that we believe to be true. For instance, if we say, “Pat knows that Bill stole the diamond.”, it is necessary that we believe that Bill is five feet tall. It is logically contradictory to say, “Pat knows that Bill stole the diamond, but I don’t believe it.” In contrast, it is acceptable to say “Pat thinks that Bill stole the diamond, but I don’t believe it.” or “Pat believes that Bill stole the diamond, but I know that Bill didn’t.” When a speaker says “X knows Y.” where Y is a sentence, it carries the speaker’s presupposition that Y is true.

A **knowledge claim** is a proposition that is alleged to be true. “Small pox is caused by a virus.”, “Men are taller than women.”, “Small pox is caused by goddess Kali.”, “Blacks are inferior to whites.”, are knowledge claims.

A knowledge claim becomes part of the knowledge for an individual or community when the claim is accepted as true. The knowledge of an individual/community is a body of propositions which are believed to be true. true. For the community of western educated individuals, the propositions “Small pox is caused by a virus.” and “Men are taller than women.” are part of knowledge, but “Small pox is caused by goddess Kali.” is a superstition, and “Blacks are inferior to the whites.” is racial prejudice.

### 1.3. Justification: Defending and Refuting Knowledge Claims

Why do we believe that the propositions “Small pox is caused by a virus.” and “Men are taller than women.” are true, while the proposition “Small pox is caused by goddess Kali.” is a superstition, and “Blacks are inferior to the whites.” is a prejudice false? Why do we

believe that the proposition “The Sun goes revolves around the Earth.” is false? Responding questions calls for providing **justification** for our beliefs.

Justification involves providing reasons for *accepting* the propositions that we regard as knowledge, that is, for considering them to be true. It also involves providing reasons for *rejecting* the propositions that we regard as non-knowledge, that is, for considering them to be false. In other words, justification involves the **defense** of what we regard as true, and the **refutation** of what we regard as false. The former justifies our acceptance, while the latter justifies our acceptance.

Suppose a believer believes that a claim P is true, and a skeptic wishes to know why the believer believes that P is true. We may think of justification as the response of the believer to the following questions from the skeptic:

Why do you believe that P is true?  
Why should I believe that P as true?

These are questions that demand that the believer defend the claim. Let us now take the scenario of a disbeliever who believes that claim P is false, and the skeptic who wishes to know why the disbeliever believes that P is false. The skeptic’s questions would be:

Why do you believe that P is false?  
Why should I believe that P as false?

These are questions that demand that the disbeliever refute the claim.

#### 1.4. Critical Thinking

Considerations of the justification of knowledge claims, involving defense and refutation, come under rubric of critical thinking. What is critical thinking? Let us offer the following answer:

**Critical thinking** is the mental process of reflecting upon something to assess its credibility, truth, significance, usefulness, value, or goodness on the basis of the information available to us and a mode of justification that we consider legitimate.

This is a broad characterization of critical thinking that applies not only to critical thinking with respect to knowledge claims, but also its application in making moral judgements, choosing a policy or action, judging the usefulness of a machine, estimating importance of a work of art, and so on. We are concerned here only with a specific form of critical thinking, namely, the one relevant for assessing what is claimed as true or false. We may therefore narrow the broad concept to the specific domain of knowledge as follows:

In the area of knowledge, **critical thinking** is the mental process of reflecting upon knowledge claims to assess their credibility, on the basis of the information available to us, and a mode of justification that we consider legitimate.

Each of us has a skeptic inside us. Critical thinking is responding internally to the skeptic’s demands of defense and refutation, providing sufficient justification for accepting or rejecting knowledge claims.

### *1.5. Three categories of beliefs: true, false and undecided*

The outcome of thinking critically about a knowledge claim may be one of the following conclusions:

There is evidence to believe that the claim is true.

There is evidence to believe that the claim is false.

There is no evidence to believe that the claim is true, and there is no evidence to believe that it is false either.

It is important to distinguish the third conclusion from the first and second. For instance, there is evidence to believe that the proposition “Apples are heavier than grapes.” is true. There is evidence to believe that the proposition “Lead floats in water.” is false. But what about the proposition “The souls of men have greater energy than the souls of women.”? Is there any evidence to believe that the proposition is true? None, as far as I can see. But is there any evidence to believe that this proposition is false? None either. In other words, there is no relevant evidence that bears upon the proposition, and I doubt if there can be such evidence.

As I said, it is important to distinguish the third category from the first two. The statement “There is no evidence to believe that vitamin E cures migraine headaches” does not mean that the proposition is false. It may very well be the case that no one has looked into this issue, and hence evidence is simply lacking to arrive at a reliable conclusion. An important prerequisite to critical thinking is the ability to keep these three categories (true, false, neither) distinct.

### 1.6. Criteria of Evaluation

The definition of critical thinking given above contains four ingredients. We said that critical thinking is:

- (A) the mental process of reflecting upon
- (B) knowledge claims
- (C) to assess their credibility
- (D) on the basis of
  - (i) information available to us, and
  - (ii) a mode of justification that we consider legitimate.

Let us take a closer look the last item, namely, mode of justification, by raising questions such as the following:

On what basis does an individual or community admit a knowledge claim as knowledge? On what basis would the claim be rejected? (How can we distinguish knowledge from superstitions, prejudices, baseless opinions, hallucinations, illusions, and mistaken beliefs?)

When two individuals/communities disagree on the acceptability of a knowledge claim, or when one claim logically contradicts another, what are the measures we can take to settle the dispute? In other words, what are the criteria on the basis of which disagreements on knowledge claims are settled?

In what follows, we will make an attempt to identify the criteria of evaluation in both commonsense knowledge and academic knowledge. We will adopt a *descriptive* rather than a *normative* approach in our enterprise. That is to say, rather than dictating what kinds of strategies people *ought to* use, we will simply unearth and spell out the principles of justification that are implicit in the actual construction and evaluation of commonsense knowledge and various disciplines of academic knowledge. Thus, in contrast to the discussion of the justification of knowledge found in philosophy textbooks, our exploration of justification will be *empirical* in character.

As a starting point, we will begin with the general principles of justification implicit in commonsense knowledge. What is your justification for believing that you have five fingers on each hand? What is your justification for believing that your sister had a stomach ache yesterday? What is the justification for believing that if you throw a stone up in the air, it will come down? Answers to such questions lead us to the modes of justification that human beings use in their construction of common sense knowledge.

Having explored the strategies of commonsense knowledge, we will turn to individual academic disciplines. We will see that not all forms of justification used in commonsense knowledge are considered legitimate in academic knowledge. For instance, if your cardiologist tells you that you have a heart problem, you would accept it as true under normal circumstances, relying on your trust in the specialist. Justification based on the credibility of the sources is also legitimate in the law court. In natural sciences, however, justification based on trust in the credibility of the specialist is inadmissible. In order to arrive at an overall perspective on human knowledge, it is important that we develop a sense of such similarities and differences of justification across different domains of knowledge.

## 2. Observations, Generalizations, and Theories

Consider the following propositions:

Clint Eastwood is taller than Jane Fonda.

Men are taller than women.

The reason for men being taller than women is the greater physical activity of men.

The first statement is an **observation**. An observation is a statement about one or more particular individuals or entities at a particular time and place. Our observation about Eastwood and Fonda exactly to one pair of individuals, namely, Clint Eastwood and Jane Fonda.

The second statement above is a **generalization**: it holds on all men and women. While an observation covers only the individuals or entities that we have actually observed, a generalization covers individuals or entities that we may not have observed yet.

The third statement above is a **theory** that speculates a probable cause or reason for the generalization in the second statement. The generalization that men are taller than women can be true and yet the alleged cause may be false: perhaps the cause is to be sought in the genetic make up of the male and female members of the species, rather than their physical habits.

Let us take an example from the natural sciences:

On January 14 1998, I placed a vertical rod on a horizontal plane under the Sun, and measured the length of the shadow every half hour. I found that the shadow of the rod was long at sunrise, became increasingly short, and became shortest at noon, after which the length of the shadow kept increasing to a maximum at sunset.

The length of the shadow of a vertical rod on a horizontal plane under the Sun is longest during sunrise and sunset and shortest during noon.

The shadow of a vertical rod on a horizontal plane under the Sun first shortens and then lengthens because of the daily rotation of the Earth around its axis.

The first statement is an observation. The second statement is a generalization of a number of singular observations of the first type. The third statement provides an explanation for the generalization in the second statement. It is part of the heliocentric theory of solar system which assumes that the Earth spins around itself and revolves around the Sun. An alternative explanation for the generalization in the second statement is that it changes in the length of the shadow are the result of the Sun's revolution around the Earth. This is part of the Geocentric theory which assumes that the Earth remains still, and the Sun goes round the Earth.

In what follows, we will explore the ways of justifying observations, generalizations, and theories.

### 3. Justifying Claims of Observation

#### 3.1. Direct Sensory Experience

The most common justification for both academic knowledge and commonsense knowledge is sensory experience. Thus, if I see a table in front of me, I am justified in believing that there is a table in front of me. Imagine the following conversation between a believer and a skeptic.

Believer: There is a table in front of me.  
Skeptic: Why do you believe that there is a table in front of you?  
Believer: Because I see a table in front of me.

At this point, the skeptic may ask:

Skeptic: Ah, but you can't believe everything that your eyes tell you. How do you know that what you see is not a hallucination, induced by a drug someone has secretly put into coffee you had a while ago? How do you know that what is you see is not an illusion, say, the hologram of a table?  
Believer: There is no evidence yet to believe that what I see is a hallucination or illusion. In the absence of legitimate reasons to believe that my sensory perception is mistaken, I would take the perception to be correct.

The skeptic's question illustrates the fallibility of sensory perception, while the response to the question illustrates the idea of what we may call *provisional knowledge*, that is, a belief that we consider to be true until we find evidence to the contrary.

The first step in the acquisition of knowledge of the world is sensory perception, which is the brain's interpretation of the sensory information from the outside world, and yet sensory perceptions are subject to error. If we take "knowledge" to be infallible truth, that is, something whose claim to truth is totally certain, we are not justified concluding that there is a table in front of us on the basis of our sensory perception. That is, the following reasoning is illegitimate from the point of infallible truth:

I see a table in front of me.  
Therefore it is reasonable to conclude that there is a table in front of me.

In contrast, if we take "knowledge" to be provisional truth, that is, something for which there is reliable evidence but lacks total certainty, then speaker X's response is quite legitimate:

I see a table in front of me.  
I am not aware of any evidence to conclude that my sensory perception is an illusion or hallucination.  
Therefore it is reasonable to conclude that there is a table in front of me.

I will use the term **projection of sensory experience** to refer to assertions about the world made on the basis of sensory experience. Thus, "I see a table in front of me." is a statement about my internal sensory experience, while "There is a table in front of me." is a projection of my internal state to the external world. The principle of justification that connects the inner state to the external world can be stated as:

### Justification based on evidence from direct sensory experience

If	P is a projection of X's sensory experience,
then	X is justified in believing that P is true,
	unless there is evidence to the contrary.

An extreme skeptic need not stop at this point. Suppose the skeptic asks:

The above principle of justification assumes that our sensory perception is triggered by some reality there, and that the perception corresponds to this reality in most cases. What is the evidence to believe that this is true?"

We will return to this question at a later point. A word of warning though. Carried to an extreme, we will discover that the skeptic's demands for the justification of the principles of justification cannot be met. For instance, most forms of justification must assume that reality is not logically contradictory. What is the justification for believing that reality is not logically contradictory? I do not know of any satisfactory answer to this question. When we dig down to the ultimate roots of rational justification, we discover a small set of beliefs which themselves cannot be justified on the basis of more fundamental beliefs.

### *3.2. Mediated Sensory Perception: Manmade Sensing Instruments*

When we pick up an apple and a grape, we experience different degrees of muscular strain. We interpret the sensation of muscular strain as weight, and conclude that the apple is heavier than the grape.

When we pick up two grapes, however, the differences on the muscular strain are so subtle, that it is very hard if not impossible to arrive at a conclusion on their relative weight. And comparing the relative weights of two grains of rice on the basis of sensor perception is simply impossible. Similarly, there is no way we can try to determine the relative weights of two elephants by lifting them. In this case, the weight is too large for the biological sensors to cope with.

When the biological instruments of perception such as the muscles, the eyes, and the ear are insufficient or less reliable, we use manmade instruments of perception. Thus, we can arrive at a reliable conclusion on the weights of rice grains or elephants by using an appropriate weighing machine. A weighing machine, therefore, can be thought of as an extension of the biological sensors.

Similarly, when the distance between two things either too small or too large for the human eye to cope with, we use a ruler as an extension. When the biologically based perception of time is inadequate, we use clocks. A certain range of heat can be measured by the sensation on the skin, but thermometers can measure heat far more accurately and in a wider range. Both commonsense knowledge and scientific knowledge are thus supplemented by the manmade extensions of sensory perception.

The use of manmade instruments provides another channel of both acquiring and justifying our knowledge of the world. Take for instance, the following scenario:

Believer: (touching the forehead of a child and declaring that she has a fever) this child has a fever.

Sceptic: Why should I believe that the child has a fever?

Believer: You can find out for yourself by touching the child's forehead, and comparing it with your forehead. The child's forehead is hotter.

Sceptic: (touching the child's forehead and his own forehead) I don't perceive any difference. I can't accept your claim that that child's forehead is any hotter.

Believer: Okay, let us use a thermometer. Do you agree that the thermometer measures temperature more accurately than our touch?

Sceptic: Yes.

Believer: (Measuring the temperature) You can see for yourself that the reading on the thermometer is 100.2 for the child, and 98.4 for you. So we are justified in concluding that the child has a fever. Do you agree?

Sceptic: Yes.

An important aspect of this dialogue is the agreement that thermometers measure temperature accurately and reliably. As in the case of the reliability of direct sensory perception, one can take scepticism a step further and question the credibility of the claim of instrumentation itself. What is the evidence to believe that a mercury thermometer measures temperature reliably and accurately? What is the evidence to believe that what we see through a microscope or telescope is reality rather than illusion? The questioning of the reliability and accuracy of information is applicable to all forms of simple and complicated instrumentation, and is an integral part of critical thinking, but we will not deal with this issue at this point.

Let us state the rationale of instrumental measurements as follows:

Justification based on evidence from instrumentally mediated sensory experience

If	X perceives measurement M on an instrument, P is an inference that follows from M, and the inference of P from M is justified,
then	X is justified in believing that P is true, unless there is evidence to the contrary.

#### **4. Justifying Generalizations**

##### *4.1. Inductive Generalization*

Let us imagine that Jen visits the island of Balgonia. She stays there for a month, and sees hundreds of people. Every adult male that she sees on the island has a beard. She would now be justified in believing that every adult Balgonian has a beard. The principle that permits this inference can be stated as follows:

Justification based on observation and induction

If	X has evidence to believe that P is true many observed instances, and has not found it to be false in any of the observed instances,
then	X is justified in believing that P is true unless there is evidence to the contrary.

As pointed out earlier, statements such as “The Sun rises in the east every day.” and “All crows are black”, are generalizations.

Now, a legitimate inductive generalization is guaranteed to be true. For instance, our generalization about adult Balgonians could be wrong. It may be the case that Balgonia has ten thousand adult males of whom nine thousand eight hundred have beards, Jen has seen only two hundred seventy two adult male Balgonians, and just by chance she did not bump into any of the unbearded ones. Or it may have been the case that all the unbearded bolgonians stay indoors and do not meet foreigners. Again, in spite of such possibilities of error, Jen’s conclusion that every adult Bolgonian sports a beard is perfectly reasonable.

While the statement “All Balgonians have beards.” makes an absolute assertion, statements such as “Most adult Balgonians have beards.” makes a statistical generalization. **Statistics** offers a way of arriving at inductive generalizations, with built in qualifications about possible error. Thus, to the conclusion that adult Balgonians have beards, a statistician would add the qualification about the confidence level of the generalization, depending upon the size of the sample.

#### 4.2. Generalization through anecdotal evidence

There are two important properties that are crucial for inductive generalizations of the kind illustrated above. They are:

- The basis must have a *large number* of observations that match the generalization.
- There must not be any contrary observations that violate the generalization.

A form of justification that does not strictly adhere to the above requirement relies on anecdotal evidence, which involves the use of one or two examples to make a generalization. Consider the following reasoning.

You know, Indians are very rude people. I went to India last summer, and I stayed in a five star hotel. The receptionist was so rude to me. There was also this immigration officer who was just awfully rude.

You should be able to find other examples of the use of anecdotal evidence in commonsense knowledge, the structure of which can be expressed as follows:

##### Justification based on anecdotal evidence

If	X has evidence to believe that P is true one or two instances,
then	X is justified in believing that P is true.

We may say that this type of evidence is a less rigorous form of evidence through induction. The use of anecdotal evidence is maximally in commonsense knowledge, but it is also found in some academic domains. Consider, for instance, how the claim “A hallmark of Romantic poetry is the use of nature imagery.” is defended in literary criticism. Let us suppose that the speaker takes one or two poems belonging to the Romantic period, picks out the nature images in these poems, and takes it that the claim is justified. When a literary critic makes generalizations of this kind, the audience typically does not ask questions about random sampling, standard deviation, confidence level, so on. In contrast, the use of anecdotal evidence is disallowed in, say, experimental psychology.

## 5. Justifying Theories and Theoretical Interpretations

### 5.1. Fit with observational clues

Let us suppose that when Jen gets back to her apartment in the evening, she finds that the door is ajar, One of the window panes is broken, with pieces of glass lying inside. When she goes in, she discovers that many of her valuable possessions (computer, jewelry, and stereo set) are missing. It would be reasonable for Jen to conclude that a burglar broke the window pane, opened the window, got in through the window, took her valuables, and left through the door.

Jen's conclusion here is neither an observation nor a generalization based on observations. It is a **theory**, an interpretation of what happened in the past on the basis of a set of clues observable in the present. Even though what really happened is not observable, we accept the interpretation as most likely to be true because it *fits with* the available clues:

<u>interpretation</u>	<u>observable clues</u>
burglar	
broke the window pane.....	broken window pane, pieces of glass inside
opened the window.....	open window
got in through the window	
took her valuables.....	valuables missing
left through the door.....	open door

The “fit” between clues and interpretations is provided by a chain of reasoning. Given the hypotheses given under the interpretation, the statements given under clues turn out to be the logical consequences of the hypotheses and our knowledge of the world. Take, for instance, the connection between the clues of broken window pane, and pieces of glass inside the apartment on the one hand, and the interpretive hypothesis of the burglar breaking the window pane from outside. The relevant chain of reasoning is given below:

Premise 1: If a person breaks a window pane from outside, the window will be broken, and there will be pieces of broken glass inside.

Premise 2: The window pane in Jen's apartment is broken, and there are pieces of broken glass inside. (clue).

Hypothesis: Suppose it is true that a burglar broke the window pane from outside.

#### Steps of reasoning

Given premise 1, premise 2 follows from the hypothesis.

Thus, the hypothesis explains the clue.

There is no better explanation for premise 2.

In the absence of a better explanation, we believe that the hypothesis is correct, until there is evidence to the contrary. (QED)

The connection between each of the clues and their interpretive hypotheses has the same character.

The above example can be generalized as follows, as the principle of justification that covers interpretations in general.

Justification of theories based on fit with observation

If	X has evidence to believe that a set of observable clues O is true, and an interpretation P fits with O,
then	X is justified in believing that P is true, unless there is evidence to the contrary.

The interpretation of the clues in the above example is called a “theory” in detective work. As Einstein & Infeld point out, scientific theories are like the theories of detectives: they too are interpretations of experimental and non-experimental observations (clues). A historian’s reconstruction of an event in the past is also an interpretation based on the clues available in the present. Archeologists, paleontologists, forensic pathologists, literary critics, anthropologists, are all people who engage in interpretive work, to name a few. Thus, the principle given in the box above applies to all forms of interpretive knowledge.

As in the previous cases, the conclusion that the proposition is true is not infallible, as indicated by the phrase “until there is evidence to the contrary.” Unlike the previous instances, however, the status of interpretive knowledge can be threatened by a better interpretation. This is an important aspect of interpretive knowledge, but we will not go into this issue at this point.

What are referred to as “analysis”, “theories”, “models” and so on in many disciplines ranging from physics to history are interpretations. In both physics and history, an interpretation is justified by showing how well it fits observed clues. However, what counts as “fit”, and the criteria for assessing “how well” it fits are not the same in the two disciplines.

## 5.2. Choosing between alternatives: Contradictory and complementary interpretations

A given set of clues can be interpreted in many different ways. Let us go back to our example of burglary in Jen's apartment. Suppose Jen calls the police, who come to Jen's apartment to examine the scene of the alleged crime. It would be perfectly possible for the possible to entertain a different interpretation of the clues. Maybe Jen broke the window pane deliberately, left the window and the door open, and removed all her valuables to make an insurance claim. In the absence of further evidence, Jen's interpretation does not appear to be any better than that of the police.

In the above example, the interpretations are logically contradictory. One of them holds that it was Jen, not a burglar, who caused the incident, while the other claims that it was a burglar, not Jen, who caused it. The two claims cannot both be true at the same time. Given this scenario, Jen may argue for her interpretation by pointing out another clue, namely, that nothing in the apartment is insured. Given this additional piece of evidence, the interpretation proposed by the police does not fit. They withdraw their interpretation as incorrect.

A different situation is posed by the following claims:

Interpretation 1: Suicide has genetic causes.

Interpretation 2: Suicide has psychological causes.

Interpretation 3: Suicide has social causes.

When stated as above, the three interpretations are complementary, not contradictory: suicide can be caused by genetic, psychological, or social factors. Acceptance of one does not necessitate the rejection of the other.<sup>1</sup>

The general principles governing the above decisions can be stated as follows:

### Choosing between alternative interpretations

- (i) If two interpretations are mutually contradictory, we must reject at least one of them. If they are not contradictory, they can both be accepted.
- (ii) Given two competing (i.e. conflicting) interpretations, we choose the better one.
- (ii) Other things being equal, an interpretation that fits more clues is better than one that fits fewer clues.

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<sup>1</sup> Many academics, however, either take such claims to be mutually contradictory, or formulate them in an extreme way so that they become contradictory. For instance,

Interpretation 1': Genetic factors are the only causes of suicide.

Interpretation 2': Psychological factors are the only causes of suicide.

Interpretation 3': Social factors are the only causes of suicide.

Research in social sciences appear to be full of unproductive battles over what ought to be treated as complementary rather than contradictory claims (e.g. the futile battle between feminists and neohistoricists).

### 5.3. *Conflicting Evidence*

Given what we have said above, there is always a chance that an interpretation that is justified on the basis of one type of evidence conflicts with an interpretation based on another type of evidence. Consider the following thought experiment. You walk into an exhibition hall, and see a paper weight on a platform. On the basis of direct sensory perception through the visual channel, you are justified in concluding that there is a paper weight on the platform in front of you. When you now try to pick up the paper weight, however, you find that your fingers pass right through the paper weight. You will now conclude that what you initially thought was a solid object was an illusion, and that there is no paper weight on the platform. If you know something about modern technology, you will tell yourself that what you saw was a hologram of a paper weight, not a real paper weight.

Let us see what is going on in this example. On the basis of the direct sensory perception through the tactile channel, you are justified in concluding that there is no paper weight on the platform in front of you. The two conclusions, each of which are justifiable when taken in isolation, lead to a logical contradiction. Evidence from two different sources are in conflict.

One of the fundamental conditions on human knowledge that almost all of us subscribe to is logical consistency, which we state explicitly as follows:

#### Criterion of internal consistency

Human knowledge cannot contain internal logical contradictions.

If we use the term “coherence” to mean “logical consistency”, we may also refer to as the condition of coherence. There is a school of philosophy that considers the coherence condition to be the definition of truth (that is, the condition is both sufficient and necessary for truth). We will take coherence to be a necessary condition, but not a sufficient condition for knowledge of the world. It is sufficient only for mathematics.

Given the condition that knowledge cannot contain logical contradictions, we are not allowed to conclude that there is a paper weight on the platform and that there is no paperweight on the platform.

In this particular instance of conflict, we will regard tactile evidence to be more reliable than the visual evidence, and conclude that what the eye tells us is an illusion.

The general principles illustrated by the above example can be stated as follows:

#### Relative strengths of evidence

In a conflicting situation, the winner is the stronger source of evidence.

It appears to be the case that given a conflict between the eye and the skin, the skin is the winner for the human brain. We will not inquire into why this is so.

Let us imagine that you consult two medical doctors. One of them says that you have a weak heart, and you need immediate surgery. The other one says that there is nothing wrong with your heart, and you do not need surgery. Suppose also that the first one is fresh from the medical college and is a general practitioner. The second one is an experienced cardiologist considered the best in the country. Under normal circumstances, your

conclusion will be that there is nothing wrong with your heart. The stronger source of evidence is the winner.

The above examples illustrate the situation where one of the competing propositions becomes the winner. There are also conflicts that point to both parties being losers. Consider the following thought experiment. A cylinder is kept hidden inside a paper box. Two people X and Y are given a flashlight, and are asked to find out what is inside the box without opening it. X flashes the light through the box, and the object casts a circular shadow. Y flashes the light from a different angle, and the object casts a rectangular shadow. The two people make the following claims:

- X: The object inside the box is a circle.
- Y: The object inside the box is a rectangle.

As formulated above, both X and Y are wrong: what is inside the box is neither a circle nor a rectangle, but a cylinder which is circular along one plane and rectangular along another. What X and Y should do, therefore, is reformulate their claims as:

- X: The object inside the box has a circular aspect.
- Y: The object inside the box has a rectangular aspect.

The revised claims are not contradictory. These are complementary, as pointed out in a previous section.

#### 5.4. *Converging Evidence and Objectivity*

Let us go back to the example of the paperweight. Suppose that when you tried to pick up what you interpreted as the paperweight, your fingers did not pass through it. Instead, your fingers touched something solid and heavy, and you picked it up. This time you will conclude that your perception of paperweight is not an illusion, but a part of “objective” reality. The sense of objectivity in this case is the result of the eye and the skin pointing to the same conclusion. To put it differently, what the eye says is corroborated by the skin.

We may state this principle explicitly as follows:

##### Corroboration: convergence of evidence from independent bases

If two independent bases of evidence converge on the same conclusions, we are justified in concluding that the conclusion is true.
--

Suppose someone tells you that a close friend of yours has been speaking ill of you to your associates. You will probably dismiss it as a rumour. However, if a large number of independent sources told you the same thing, you will probably change your mind and begin to think that the report may have some truth in it. Corroboration triggers conviction.

We may now define **objectivity** as *independent corroboratability*. Let us suppose that Jen wakes up in the morning one day, and recalls the sense of a stranger being near her bed at night. She would probably dismiss it a dream, an extreme case of subjective experience. However, her sister wakes up and reports the same feeling of a stranger being inside the room at night, Jen would conclude that her initial feeling was not so subjective at all, because it is corroborated by her sister’s impression. If she now sees that her window is forced open, and her jewelry is missing, the sense of objectivity would be further heightened.

From purely subjective to totally objective is a continuum. The position that I have taken so far is that there is nothing that we can prove to be totally objective. However, the greater the degree of independent corroborability, the greater the objectivity.

On the basis of the above discussion, as well as our previous discussion of contradictory and complementary interpretations, we may add the following principles to our list for the general principles of justification in the domain of theories or interpretations.

Prohibition of logical contradictions

Human knowledge cannot contain internal logical contradictions. If two claims are logically contradictory, we must reject at least one of them.

Generality

Other things being the same, an interpretation that fits with a greater range of clues is better than one that fits only with a smaller range.

Convergence of evidence

The greater the convergence/corroborations of evidence from independent sources, the greater the reliability/objectivity of the knowledge.

## 6. Knowledge as Provisional Truth

In the preceding sections, we pointed to the following strategies of justification found in commonsense knowledge, many of them found in academic knowledge as well.

Observations

- Direct sensory perception
- Instrumentally mediated sensory perception

Generalizations

- Inductive generalization
- Anecdotal evidence

Theories

- Fit with observations
- Internal consistency
- Generality
- Convergence of Evidence

Taking sensory perceptions as the basis of observations, the relationships among the above types of claims can be diagrammatically expressed as follows:

sensory perception --> observation --> generalization --> theory

You must have noticed that these principles crucially involve the qualification “unless there is evidence to the contrary” all the way. This is an explicit acknowledgment that what we consider to be truth at the present moment can turn out to be false when novel evidence is available. We will refer to such a belief as *provisional truth*. In contrast, the remaining three (namely, infallibility of the source, tradition, and anecdotal evidence) do not contain this qualification. Without the acknowledgment of possible error, these principles claim *absolute truth*.

- Provisional truth: I believe that P is true, but my belief could be wrong.
- Absolute truth: I believe that P is true, and P is really true. Therefore my belief can never be wrong.

Thus, our principles of justification yield only provisional knowledge: knowledge that is uncertain and fallible. If so, we must conclude that nothing that we can say about the world can be established to be really true, without any possibility of error. This applies even to the most “objective” forms of knowledge in the physical sciences.

We are therefore faced with two choices. One of the choices is to insist on the concept of knowledge as infallible totally certain truth built into the verb *know*. This position would force us to the conclusion that we have no knowledge of anything about the world. Even what is considered scientific knowledge is not knowledge by definition. The other choice is to relax our demand, and change our definition of knowledge to include provisional truth. This position would allow us to retain a considerable body of what we currently consider to be knowledge as knowledge. Needless to say, the latter alternative is preferable unless we are willing to accept the conclusion that humans have no knowledge of the world.

If we adopt the idea of knowledge as beliefs that can be justified as provisional truth, we do not need to repeat the qualification “unless there is evidence to the contrary”, because this qualification is built into the notion of provisional truth. The substance of the general principles of justification which incorporate provisional truth can be summarized as follows:

We are justified in believing that a knowledge claim P is provisionally true if:

- A) Direct sensory experience: P is a projection of our sensory experience.
- B) Instrumentally mediated sensory experience: P is an inference that follows from measurement M on an instrument, and the inference of P from M is justified.
- C) Inductive generalization: P is a generalization, and we have evidence to believe that P holds true in many observed instances.
- D) Fit with observations: P is an interpretation, and we have evidence to believe that a set of observable clues O is true, and P fits with O.

When evidence against such a knowledge claim becomes available, the justification for taking the claim to be provisionally true disappears.

## 7. Logic and Mathematics: Justification through Proof

The preceding sections discussed the modes of justifying knowledge claims on a provisional basis. The conclusion in the modes of justification we have discussed crucially involved the acknowledgement of tentativeness in the phrase “until we find evidence to the contrary.” This is because these forms of justification are based on *limited information*: on the basis of available information, we conclude that P is true, but when more information becomes available, we may have to conclude that P is false.

Now, a form of justification to which the above character of tentativeness does not apply is that of proof in mathematics and logic. Justification through proof has the following property:

Proof:            A knowledge claim P is true if P is proved to be true.

An important characteristic of proof is that it does not refer to provisional truths. Once a belief is *proved* to be true, no new evidence can cast doubts on its truth. In this respect, proof is different from all other forms of justification.

Proofs are typically found in logic and mathematics. It is typically not found in commonsense knowledge, but it is important that we understand the nature of proofs as a reference point if we wish to understand other the nature of other forms of justification.

Let us take an example. When school children are taught mathematics, they are told that the product of two negative numbers is a positive number. Thus, when we multiply  $(-3)$  with  $(-5)$ , the result is  $(+15)$ , not  $(-15)$ . How do we prove that this is true?

If we can demonstrate that for any numbers  $a$  and  $b$ , the product  $(-a)(-b)$  is equal to  $(a)(b)$ , we have a proof for this knowledge claim. In his book *The Art of Mathematics* (1992:75-76), Jerry P. King gives the following proof:

“Let  $a$  and  $b$  be any two real numbers. Consider the number  $x$  defined by:

$$x = ab + (-a)(b) + (-a)(-b)$$

We can write

$$\begin{aligned}x &= ab + (-a) [(b) + (-b)] \\ &= ab + (-a)(0) \\ &= ab + 0 \\ &= ab.\end{aligned}$$

Also

$$\begin{aligned}x &= [a + (-a)]b + (-a)(-b) \\ &= 0 \cdot b + (-a)(-b) \\ &= 0 + (-a)(-b) \\ &= (-a)(-b)\end{aligned}$$

So we have

$$\begin{aligned}x &= ab \\ x &= (-a)(-b) \\ ab &= (-a)(-b) \quad (\text{claim proved})\end{aligned}$$

The above example uses algebraic symbols to prove the result. Proofs can also be done in ordinary English. Take for instance, the proposition that the set of prime numbers is infinite. A prime number is one that cannot be divided by anything other than itself and 1. 1 and 2 are prime numbers, so is 3. 4 is not a prime number because  $4 = (2)(2)$ . 5 is a prime number. 6 is not a prime number because  $6 = (2)(3)$ . 7 is a prime number. 8 is not a prime number because  $8 = (2)(4)$ . 9 is not a prime number because  $9 = (3)(3)$ . 10 is not a prime number because  $10 = (2)(5)$ . Euclid proved in 300 BC that there are infinitely many prime numbers. The proof, summarized in by King (1982), is as follows:

“Suppose there are only finitely many prime numbers. Let  $n$  be the number of primes. Denote this finite set of primes by  $p_1, p_2, p_3, \dots, p_n$ . Look at the number  $x$  given by

$$x = p_1 p_2 p_3 \dots p_n + 1.$$

Now  $x$  is clearly a positive integer and is clearly not a prime. (It is larger than the product of all the primes, and therefore, is larger than any single prime.) So  $x$  must be divisible by some prime. (Since  $x$  is not a prime, it has proper divisors. So  $x = a.b$  where  $a$  and  $b$  are integers larger than 1. If  $a$  or  $b$  is a prime, then we have a prime that divides  $x$ . Otherwise  $a$  and  $b$  have factors which are either prime or themselves have factors. Thus,  $a = a_1 a_2$  and  $b = b_1 b_2$ , say. Then  $x = a_1 a_2 b_1 b_2$ . Continuing in this manner we conclude that  $x$  is actually a product of primes by  $p_1, p_2, p_3, \dots, p_n$  because each of these, upon division into  $x$ , will clearly leave a remainder of 1. (For example, if 2, 3, 5 were *all* the primes, then  $x = 2.3.5. + 1 = 31$  and dividing 31 by either 2, 3 or 5 leaves a remainder of 1.) Consequently, there must exist some other prime other than those in our list. This is a contradiction since our list contains all the prime numbers. Thus, there are infinitely many prime numbers.” (p.84)

Recall that we characterized justification as the believer’s response to the skeptic’s question “Why do you believe claim P?”. Each of the types of justification discussed above involves

- i) the *basis*, or a set of premises on which the justification is built.
- ii) the demonstration, that given the basis, the claim can be derived as a logical consequence of the premises in the basis.

In all domains of knowledge except logic and mathematics, it is important that the believer and the skeptic accept the premises of the basis as true (or provisionally true, in the sense described earlier). The credibility of the basis is irrelevant in logico-mathematical proofs. All that the believer demonstrates is that one set of propositions follows from another set of propositions. That is, if we accept  $X$ , we must also accept  $Y$ . Whether or not  $X$  is true is irrelevant. For instance, the basic premises in the proof of the proposition that the sum of angles in a triangle 180 degrees are the *postulates* of Euclidean geometry. These postulates are not claimed to be either true or false. All that the proof tells is that *if* the postulates are true, then the proposition “The sum of angles in a triangle 180 degrees.” is necessarily true. If we change the postulates, the result does not follow. We may refer to this type of justification as justification through *pure reasoning*.

Nearly a century ago, Bertrand Russell pointed out in an article entitled *Recent Work on the Principles of Mathematics* (1901) that pure mathematics does not make any claims about the world: all it does is demonstrate that given a set of premises, certain conclusions necessarily follow:

“Pure mathematics consists entirely of such assertions as that, if such and such proposition is true of *anything*, then such and such another proposition is true of that thing. It is essential not to discuss whether the first proposition is really true, and not to mention what the anything is of which it is supposed to be true. .. If our hypothesis is

about *anything* and not about one or more particular things, then our deductions constitute mathematics. Thus mathematics may be defined as the subject in which we never know what we are talking about, nor whether what we are saying is true.”

Another important characteristic of logico-mathematical proofs is that if a set of premises is true, a conclusion that has been proved on the basis of these premises is necessarily true. In other words, given a valid proof, it cannot be the case that the premises are true and the conclusion is false. This property is missing in the other modes of justification.

As I said earlier, classical logic equates “valid argument” with “valid proof”, taking mathematics as the ideal form of knowledge. As a result, introductory logic courses teach the doctrine that only classical deductive reasoning, is valid. Other modes of reasoning, such as inductive reasoning, analogical reasoning, and non-monotonic deductive reasoning are considered invalid by the criterion of proof. Now, there is no harm in using words the way we want, but the term “invalid” has an implication of defect, and therefore creates the mistaken impression that non-deductive reasoning or non-monotonic deductive reasoning are somehow defective. It would be more fruitful, therefore, to use the term “valid” to mean “permissible within a given system of logic”. If so, we can talk about “deductively valid”, “inductively valid”, “abductively valid” and so on, without implying that nothing other than Aristotle’s logic is valid.

It might be useful to bear in mind that we often use the word “proof” in ordinary language without requiring the rigour demanded by logico-mathematical proofs. For instance, a judge in the law court may say that the prosecution lawyer has proved that the defendant is guilty. The use of the word “prove” in law does not have either of the two properties characteristic of the logico-mathematical proofs. A theoretical scientist would rephrase the judge’s statement as “The prosecution lawyer has provided evidence that justifies the belief that the defendant is guilty.”

In the preceding sections, we took the position that what we call knowledge of the world is *what we take to be provisional truth on the basis of available evidence*. We acknowledge that no *basis* of evidence is infallible, which means that human knowledge of the world cannot have a totally certain infallible foundation. What we said here amounts to saying that we reject what is called “strong foundationalism” in philosophy.

## **8. Explicit and Intuitive Justification**

The forms of justification that we have enumerated so far are all explicit in the sense when challenged by a skeptic, the believer can make an explicit statement of the basis of the belief, as well as the path that connects the basis to the belief being questioned. When either the basis or the path is unavailable for conscious scrutiny, but remains hidden in the unconscious part of the mind, we say that the justification is intuitive, and not explicit. The forms of justification discussed so far are all explicit.

When I look at Rembrandt’s painting of a man wearing a golden helmet, I am struck by its closeness to reality. With its colour, highlights and shadows, the picture of golden helmet seems so much like a real golden helmet. Similarly, when I read a few pages from Vikram Seth’s novel *Suitable Boy*, I am struck by the feeling that Vikram Seth has captured the reality of life in India so faithfully.

I believe that Rembrandt's painting of a man with a golden helmet is true to life.  
I believe that Vikram Seth's novel *Suitable Boy* is true to life.

The basis of my judgment is what one may call **intuitive resonance**. In my life as a person, I have stored a large collection of experiences in my memory. When I look at a painting or read a novel, I match the pattern provided by the painting or novel against this store of experiences in an unconscious manner. If the details of the unconscious pattern match the details of what I see or read, the two are in harmony, and my mind resonates, saying, yes, how true! Intuitive resonance is this "How true!" feeling. The crucial feature of intuitive resonance is that the pieces and the connections that lead to the resonance is unavailable for conscious scrutiny. Intuitive resonance leads to remarks like "It makes sense to me, but I can't tell you why.", "I have this intuition that I am right, but I can't defend it.", "I don't agree with you, but I can't tell you why you are wrong."

How would others evaluate my claims of the verisimilitude of Rembrandt's painting and Seth's novel? The answer is that they will have to experience the same resonance. They will have to look at Rembrandt's painting, and read Vikram Seth's novel. If their unconscious storage of experiences match what they see and read, they too will say, yes, how true. If not, they will reject my claims.

Suppose I wish to make the claim that there is more meaningless violence in Hindi movies than in Malayalam movies. It is unlikely that I will be able to establish the claim in terms of any of the rigorous means of justification discussed earlier. The only justification that I have for believing that I am right is my intuitive perception, which is a pattern that arises out of a number of stored experiences. You will agree with me if my claim creates a resonance in your store of experiences, and reject it if it does not.

The mode of justification that underlies these examples can be stated as follows:

Justification based on intuitive perception and resonance

If	X intuitively perceives P
then	X is justified in believing that P is true, unless there is evidence to the contrary.
If	X intuitively resonates to the claim P that someone makes
then	X is justified in believing that P is true, unless there is evidence to the contrary.
If	X intuitively resonates more to P than to P'
then	X is justified in accepting P and rejecting P'. unless there is evidence to the contrary.

## 7. Socially Constructed Pool of Knowledge

### 7.1. Personal and Socially Transmitted Knowledge

Some of our knowledge of the world is based on our direct first hand experience. For instance, we know that ice cream is sweet because we have eaten ice-cream ourselves and have found it to be sweet. We will refer to the beliefs based solely on personal direct experience as **personal knowledge**.

Now, one of the important characteristics of the human species is that a human being can acquire knowledge from the other human beings in the community. For instance, we all know that cobra bite is lethal, but very few of us have had first hand experience of the effect of cobra poison. We believe that the proposition about cobra bite is true because others have observed its effect and reported it to us. We will refer to the beliefs based on the reports of other human beings as **socially transmitted knowledge**.

An important prerequisite for socially transmitted knowledge is the existence of a system of communication through which beliefs can be transmitted. The human species is able to amass a pool of socially transmitted knowledge because of the system of communication called language. In contrast, chicks possess no comparable system of communication, and hence the knowledge acquired by one chick disappears with the death of the chick. When chicks are given different coloured beads to peck, and one of them are coated with a poison that makes them sick, they learn to associate colour with the sickness, and avoid pecking at the harmful beads. Because they have no system of conveying this knowledge to the other members of the community, the experience of one chick does not benefit another. As a result, chicks, unlike humans, have no way of constructing a social pool of knowledge that gets passed on from one individual to another, and one generation to the next.

In what follows, we will explore some of the patterns of justification in the transmission of knowledge across individuals in a community.

### *7.2. Reported Sensory Experience and Measurements*

In section 2, we talked about the direct sensory experience of a human being as one of the sources of knowledge. Another common source of human knowledge is someone else's sensory experience. Suppose Pat tells Jen that Pat saw Clint Eastwood in a restaurant the day before. Jen is justified in believing that Pat saw Clint Eastwood the day before, even though this belief is subject to two levels of error. First, it may be the case that Pat was simply mistaken. The person that she saw was not Clint Eastwood, but someone who looked like Clint Eastwood. Second, Pat may be deliberately telling a lie, perhaps to impress Jen. She may not have seen someone who even looks like Clint Eastwood. In spite of such possibilities of error, we take human reports to reflect truth.

The principle of justification that legitimizes such inferences can be stated as follows.

#### Justification based on evidence of reports of sensory experience

<p>If            P is a projection of Y's sensory experience, and                           Y reports P to X,          then        X is justified in believing that P is true,                           unless there is evidence to the contrary.</p>
--

### *7.3. Credibility of the Source*

Suppose Jen goes to a doctor for an annual check up. At the end of the examination, the doctor tells Jen that she has a weak heart and should therefore be careful. Jen is justified in concluding that she has a weak heart. Once again, there are many sources of error. First, the doctor may be telling a lie. Second, the statement that Jen has a weak heart is not a matter of neither observation nor generalization, because he cannot look directly at the heart and observe the weakness. What the doctor does is to observe a few clues such as the rhythm of

the heartbeat, and make an inference on the basis of such clues. That is to say, the statement that Jen has a weak heart is an *interpretation* of clues based on sensory perception, it is not a sensory perception by itself.

If someone at the bus stop initiated a conversation with Jen, and told her that she had a weak heart, she would not probably take the statement seriously. “How do you know? Are you a doctor?” would be the immediate response to such a scenario. The reason why Jen is willing to accept the doctor’s statement as knowledge is because her doctor is a specialist. She has reason to believe that a specialist knows more than non-specialists, and her past experience with her doctor corroborates her trust . In other words, her justification is the credibility of the source of the knowledge claim. We may formulate the principle of justification involved in this example as follows:

Justification based on the credibility of the source

If	P is a proposition in domain D asserted by Y, and
	X has evidence to believe that Y’s judgment on domain Y is credible,
then	X is justified in believing that P is true,
	unless there is evidence to the contrary.

7.4. *Infallibility of the source*

It is important to distinguish between *credibility* of the source on the one hand, and *emotional appeal* of the source on the other. Human beings tend to trust speakers who have a confident voice, look scholarly, have a charismatic air about them, and so on. They also tend to trust famous people, and people who are perceived as authorities. This form of trust is rooted in an emotional factor, rather than the credibility of the source. For many people, the implicit trust that many people have in teachers, textbooks, printed word, tradition, and scriptures is generally rooted in the emotional hold of the source rather than in the past experiences that point to the credibility of the source. In an extreme form, trust rooted in emotional factors leads to absolute trust, or belief in the infallibility of the source.

Let me explain. Credibility of the source is a *provisional trust* that acknowledges that the source is fallible, and hence what the source tells us is not guaranteed to be true. In contrast, many forms of emotionally governed trust lead to an *absolute trust*, which is unwilling to grant that the source could be wrong. What distinguishes an intelligent adult’s provisional trust in her family doctor from a child’s absolute trust in her grandmother is that the former, not the latter, is tempered with an acknowledgment of uncertainty and fallibility.

Consider, for instance, an uneducated person’s absolute trust in the media: the TV says that Grow-Hair lotion will cure baldness in four months, so I will buy it and I won’t be bald anymore:

Everything that TV says is true.

TV says that Grow-Hair lotion will cure baldness in four months.

Therefore the statement “Grow-Hair lotion will cure baldness in four months.” is true.

Children’s trust in teachers, textbooks, and older people, and the average adult’s trust in the media, printed word, tradition, and scriptures are very often a form of absolute trust. We may therefore characterize this type of justification as justification based on the infallibility of the source.

Justification based on the infallibility of the source

If	P is a proposition asserted by Y, and Y is infallible,
then	X is justified in believing that P is true.

Note that the final qualification “unless there is evidence to the contrary.” does not appear in this type of justification. This is because the source cannot be fallible, and hence there cannot be any evidence to the contrary in principle. Note also that the reference to the *evidence* for the trustability of source’s judgment is also absent here. This is because the trust in the source need not be based on any prior experience.

This mode of justification is clearly illustrated in the following extracts from Henry Morris, head of the Institute for Creation Research (ICR). The first extract is from his book *Studies in the Bible and Science*:

“If man wishes to know anything about Creation... his sole source of true information is that of divine revelation. God was there when it happened. We were not there... Therefore, we are completely limited to what God has seen fit to tell us, and this information is His written word. This [the Bible] is our textbook on the science of Creation!”

In his book *The Remarkable Birth of Planet Earth* , Morris says:

“The only way we can determine the true age of the Earth is for God to tell us what it is. And since He has told us, very plainly, in the Holy Scriptures that it is several thousand years in age, and no more, that ought to settle all basis questions of terrestrial chronology.”

For Morris, the proposition that the Earth is only several thousand years in age is an infallible truth. To reach this conclusion, Morris needs to believe that the following propositions are infallible truths.

1. There is an omniscient infallible God who never misleads humans.
2. Scriptures are revelations of God to humans.
3. The Scriptures do not contain anything that God did not reveal.
4. When human beings wrote down God’s revelations as the Scriptures, they did not introduce any inaccuracies or distortions.

From (1)-(4), it follows that Scriptures are infallible. Given the proposition that the Scriptures say that the Earth is only a few thousand years old, it would then follow that the proposition that the Earth is only a few thousand years old is true without the shadow of doubt. However, if the absolute certainty of any one of (1)-(4) is questioned, the conclusion does not follow.

As far as one can tell, there is no way of proving that propositions 1-4 are totally certain truths. Yet, none of them are open to questioning for Morris. It is this closure, the unavailability of questioning, that distinguishes dogma from rationally justified beliefs.

The reader might point out that Morris’s commitment to (1)-(4) parallels the scientist’s commitment to (5)-(7):

5. Nature is logically consistent (i.e., non-contradictory.)
6. The laws of nature are very simple.
7. Nature is amenable to empirical-rational investigation.

Both (1)-(4) and (5)-(7) are matters of faith. However, the scientist's faith in (5)-(7) is tentative. If we ask a scientist, "Do you know for certain that Nature is logically consistent?", the response would be, "I have seen no reason to believe that this is false, and I believe this because it is the very basis of science, but then I could be wrong." The acknowledgment of uncertainty and fallibility is the essence of scientific knowledge, including the very foundations stated in (5)-(7). In contrast, Morris' faith in (1)-(4) does not permit the acknowledgment of fallibility. Could he be wrong in his belief that scriptures do not contain anything that God did not reveal? No. In other words, Morris believes that he is infallible in believing that (1)-(4) constitute absolute truth.

If arrogance is a sin, Morris' God would probably censure him for his sin, and commend the scientist's humility in acknowledging that humans have no access to total certainty and infallibility. God may be infallible, but human beliefs are not.

### 7.5. Tradition

Let us imagine that Jen believes that Jews are bad people. Suppose we ask Jen why she thinks that Jews are bad. A probable answer would be that everyone in her community believes that Jews are bad, and they can't all be wrong, can they? Let us state the principle behind this response as follows:

#### Justification based on tradition

<p>If            the other people in X's community believe that P is true, then        X is justified in believing that P is true.</p>
--

I am not saying that this is a legitimate principle of justification. All I am saying is that a great deal of commonsense knowledge stems from the human tendency to absorb the beliefs of the community through osmosis. Children growing up in a community absorb the beliefs of the adult individuals around them, and when they grow up, pass on the beliefs to the next generation. What we call traditional beliefs are the result of this mechanism, resulting in beliefs being passed on from one generation to the next. A child growing up in a traditional Hindu community believes that eating beef is bad, while a child growing up in a traditional Jewish community believes that eating meat mixed with yogurt is bad. Similarly, a child in one community believes that the true God is X, while a child growing up in another community believes that the true God is Y. In the large majority of cases, it is the accident of birth in a particular community that decides which traditional belief a child would grow up to be a believer of.

The traditional knowledge passed on from one generation to the next in this manner contains what many of us would regard as mythologies (belief in Santa Claus, tooth fairies), superstitions (belief in demonic possession), prejudices (belief in the inferiority of the blacks). It also contains what we would regard as reliable knowledge (traditional medicine, grandmother's wisdom). If we acknowledge that traditional wisdom can contain both mumbo jumbo and reliable knowledge, it follows that we need a way of separating the two.

What I characterized above as the principle of justification based on tradition does not allow us to make this separation, because tradition is a priori taken to be infallible.

In sum, justification based on the infallibility of the source and tradition have the property that they are *not open to questioning*. The doctor's claim that small pox is caused by a virus is open to questioning, but the claim of the tradition that small pox is caused by goddess Kali is not open to questioning. Such forms of justification are opposed to the very spirit of critical thinking, namely, the freedom to challenge and question.

In passing, let me mention that many people define "objectivity" as "intersubjectivity". That is, a belief becomes objective if it is shared by other people. Intersubjectivity is really a variant of what we called tradition. Does a superstition ("Small pox is caused by goddess Kali.") or prejudice ("Blacks are inferior to the whites.") become objective simply because it is widespread in a community? It would therefore be more appropriate to use independent corroboration rather than intersubjectivity as a measure of the degree of objectivity.

In this section, we unearthed reported sensory perception, credibility of the source, infallibility of the source, and tradition as a set of additional principles underlie the social transmission of beliefs in every day knowledge. Of these, the first two acknowledge the uncertainty of knowledge:

#### **8. Refuting Knowledge Claims** [to be written]

#### **9. Criteria of Justification in the Sciences** [to be written]

#### **10. Incommensurability: Debates that cannot be settled through argumentation**

In the preceding sections we discussed various strategies of responding to the skeptic's demand for justification of knowledge claims, differing in their degree of reliability. Most of us would probably consider justification through proof as maximally reliable. Chances are that we would also consider justification based on tradition and anecdotal evidence less reliable than others. As for justification through the infallibility of the source, those who subscribe to it would consider it to be perfectly reliable, while those who do not subscribe to it would consider it to be totally unreliable.

Let us use the term **epistemological value system** to refer to a set of commitments to the strategies of justification in the pursuit of knowledge. These commitments involve:

- accepting a set of strategies as reliable while rejecting others as unreliable
- considering some strategies to be more reliable than others

Individuals and communities may differ in their epistemological value system. When this happens, we have the situation that philosopher Thomas Kuhn called **incommensurability**. Consider a debate between the following individuals Sam and Tom. Sam is committed to the infallibility of scriptures, and believes that the evolutionary hypothesis in biology is false, while Tom rejects the infallibility of scriptures, and believes that the evolutionary hypothesis in biology is provisionally true. A rational debate between Sam and Tom is meaningless, because their value systems are incommensurable. Argumentation in this case would be like two people engaged in game, one person playing football and the other playing basketball.

Similar instances of incommensurability arise between epistemological value systems that subscribe to the infallibility of two different sets of scriptures. If one set of scriptures assert that the only true God is the God of the Jewish scriptures, and the other set of scriptures assert that the only true God is the God of the Christian scriptures, it is meaningless for the individuals or communities that subscribe to their respective scriptures to engage in a rational argument.

Here, then, is the source of real conflict between science and religion. Science accepts direct sensory perception, reported sensory perception, inductive generalization, fit with observations, prohibition of logical contradictions, generality, and convergence of evidence as legitimate criteria of public justification. In scientific debates, credibility of the source, infallibility of the source, and tradition are treated as unreliable. In contrast, the extreme form of orthodox religion takes the infallibility of scriptures as the primary consideration that outweighs all other considerations. The conflict is not between knowledge claims, but between the epistemological value systems.

## **Appendix: Knowledge, prejudice, illusion and superstition**

Webster's Encyclopedic Unabridged Dictionary of the English Language (1989) contains the following entries on faith, belief, dogma, doctrine, tenet, opinion, superstition, prejudice, illusion, hallucination, and knowledge.

<b>Faith</b>	Confidence or trust in a person or thing, belief which is not based on proof.
<b>Belief</b>	Something believed; an opinion or conviction, confidence in the truth or existence of something but not immediately susceptible to rigorous proof ( <b>believe</b> : to have confidence in the truth, the existence, or the reliability of something, although without absolute proof that one is right in doing so.)
<b>Dogma</b>	A specific tenet or doctrine authoritatively laid down, as by a church
<b>Doctrine</b>	A particular principle, position, or policy, taught or advocated, as of a religion
<b>Tenet</b>	Any opinion, principle, doctrine, dogma etc. held as true.
<b>Opinion</b>	A belief or judgment that rests on grounds insufficient to produce certainty; a personal view, attitude, or appraisal
<b>Superstition</b>	A belief or notion, not based on reason or knowledge
<b>Prejudice</b>	An unfavorable opinion, or feeling, formed beforehand or without knowledge
<b>Illusion</b>	Something that deceives by producing a false impression;
<b>Hallucination</b>	An apparent sensory experience of something that does not exist outside the mind, sense perception not caused by external stimuli
<b>Knowledge</b>	Acquaintance with facts, truths, or principles, as from study, or investigation (know perceive, or understand as fact or truth; to apprehend clearly and with certainty)

These insistence on “truth”, “certainty”, and “proof” in these entries conflict with our the notion of knowledge presented in the preceding sections. I would therefore modify “faith”, “belief”, “opinion” and “knowledge” as follows:

### Revised characterizations

<b>Faith</b>	Confidence or trust in a person or thing, belief which is not based on <i>sufficient evidence</i> .
<b>Belief</b>	Something believed; an opinion or conviction, confidence in the truth or existence of something but not immediately susceptible to rigorous <i>justification</i> ( <b>believe</b> : to have confidence in the truth, the existence, or the reliability of something, although without <i>reliable evidence</i> that one is right in doing so.)
<b>Opinion</b>	A belief or judgment that rests on grounds insufficient to produce the <i>required degree of certainty</i> ; a personal view, attitude, or appraisal

**Knowledge**

*A set of beliefs that a community or individual accepts as true, justified in terms of the epistemic value system of that community or individual.*