

# Chapter 9

## Justifying

### 9.1 What is Justification?

Suppose you are reading an article, and are expected to evaluate it. The article claims that the general wellbeing of human beings has improved significantly over the last century as a result of science and technology. As a critical thinker, you would like to know the grounds for the claim, and how exactly these grounds support the claim. How would you find out?

The simplest way is to ask the author. Your questions would take one of these forms: “What is the evidence for that conclusion?” “What is the proof for that claim?” “Why should we accept your claim?” “Why should we believe it?” or “How do you know that?”

**Justification** is a response to such questions.

A research paper, article, thesis, or book arrives at **conclusions**, and presents them to a jury of experts as **claims**. The experts are skeptical, but open-minded. The researcher provides justification to convince the jury that the claim(s) must be accepted as correct.

Suppose you are that researcher. How would you justify — or refute — the claim that the general wellbeing of human beings has improved significantly over the last century as a result of science and technology? Let us look at a few simple cases of justification before we attempt to answer this question.

### 9.2 The Structure of Justification

Imagine that Zeno and Athena are colleagues. One day at work, Zeno tells Athena that he has only four toes on his right foot; he lost his big toe in an accident. Athena is shocked. She says, “I don’t believe you!” Zeno takes off the shoe and sock on his right foot, and says, “See for yourself!” In doing so, he is inviting her to **directly perceive** the grounds for his claim, and convinces her.

**grounds:** an independent observer can perceive the toes on the right foot.



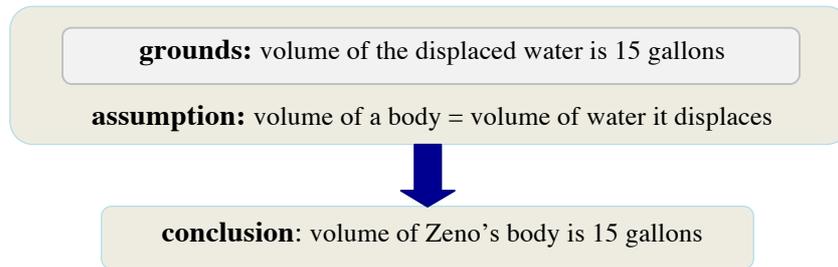
**conclusion:** the right foot has only four toes.

In this example, justification consists of pointing to — or inviting attention to — an object or situation.

Take a different example. Suppose Zeno claims that his body can fit into a small barrel that is half a meter in diameter. He convinces Athena by getting inside such a barrel, and inviting her to see this for herself. This example is slightly more complex; it involves a **demonstration** in which the person making the claim *does* something, and invites the skeptic to observe the results.

Take yet another case. Zeno claims that the volume of his body is 15 gallons. Athena is skeptical. Zeno fills a tub with water, and, with Athena watching, immerses himself in the tub. He invites Athena to **measure** the amount of water flowing out of the tub. She does so, and finds that it is 15 gallons. This proves that Zeno’s body volume is 15 gallons. Here, Athena can’t actually see or measure the volume of Zeno’s body. But she can measure the volume of the water overflowing from the tub, from which she **infers** Zeno’s body volume. Implicit in this inference is a background

**assumption** that she shares with Zeno: “The volume of a body is equal to the volume of water it displaces.”



If Athena chooses to question this assumption, Zeno will have to provide justification for it.

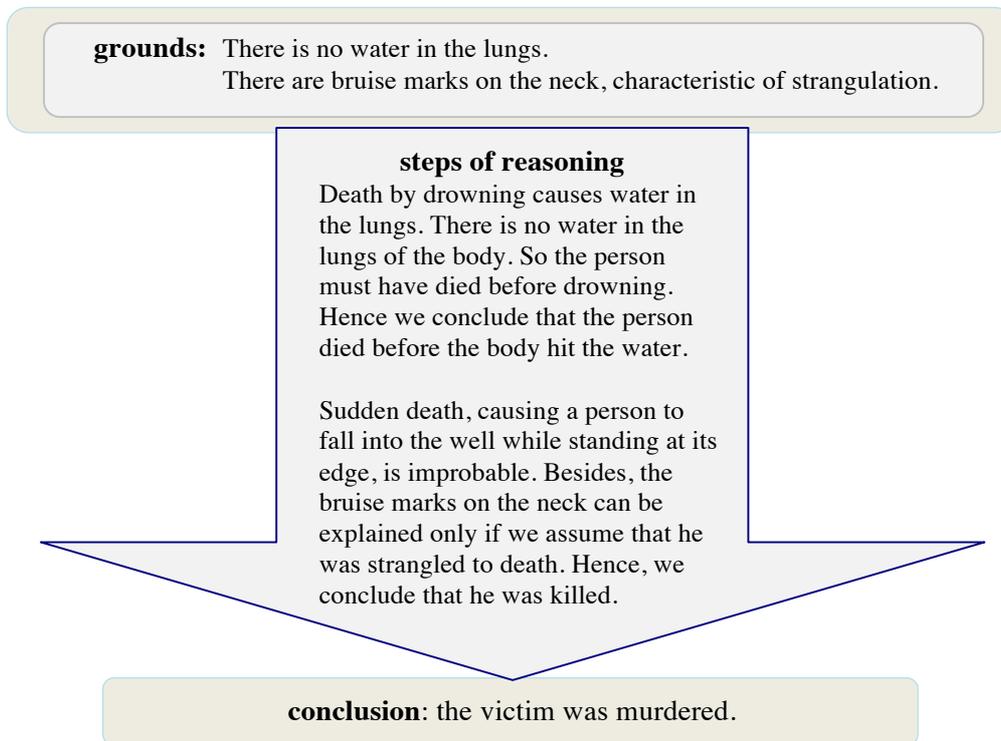
Now, in a face-to-face conversation, a speaker can invite the listeners to observe the relevant objects or situations. But this is not feasible in written justification. Zeno can't say in an email to Athena, “Measure, and see for yourself, the amount of water my body displaces.” He has to do the measuring, and report the results. The grounds offered in experimental research, interviews, and ethnography are of this kind: the grounds are **verbal reports** of what the researcher observes.

Let us move on to yet another type of claim. Suppose Zeno is a medical doctor who specializes in forensics. He has just finished examining a dead body found in a well. He sends Athena an email with his claim, and an email exchange follows:

- Z: Hi Athena, I've just examined the body I told you about. This death was not an accident or a suicide: it was a murder.
- A: What makes you say that, Zeno?
- Z: There is no water in the lungs.
- A: So?
- Z: When a person dies by drowning, there is always water in the lungs, because of the victim's gasping for air. Water doesn't get into the lungs if the person is already dead. So it has to be that this person died first, and the body hit the water afterwards.
- A: Makes sense. That rules out the suicide hypothesis. But...
- Z: But what?
- A: It only means that he died first and hit the water later. He could have fallen into the well because he had a heart attack when standing at its edge. What makes you say that someone killed him? What evidence do you have?
- Z: Well, let us see. If you are right, this was an accidental death. If so, he must have been standing close to the edge of the well when he had the heart attack, and death must have been instantaneous, before he hit the water.
- A: That's right.
- Z: Hmm, this is not impossible. But the probability is very low.
- A: Oh! (About to say something, but Zeno interrupts.)
- Z: Also during the postmortem, I found blue bruise marks around his neck, the kind that we find when a person is strangled.
- A: Ah, I see now! If we assume that he was strangled, we have an explanation for the bruise marks.
- Z: Exactly. And otherwise, there is no explanation. Bruises on the neck, absence of water in the lungs: they pretty much force us to conclude that he was murdered.

Unlike the previous examples, the connection between the grounds (absence of water in the lungs, bruises on the neck) and the conclusion (killing through strangulation) in this example is mediated through an *extended* form of **reasoning**. The diagram below gives a visual representation of the

justification. For practice, you may wish to unpack the reasoning into numbered premises and the intermediate conclusions, leading to the final conclusions.



### EXERCISE 1

When a child doubts and questions an assertion, implicitly asking why she should believe something, adults tend to respond along one of the following lines:

- Because I say so.
- Because that is what you have been taught.
- Don't ask such stupid questions.
- You won't understand if I tell you.

These responses have the effect of dampening the child's capacity for critical thinking. Let us make a New Year resolution today — whether it is actually New Year's day or not — that we won't do that to a child.

Imagine that Athena is a ten-year old girl, and that you are Zeno. Looking at the night sky, Athena says, "Zeno, the moon is so much bigger than the stars!" You correct her: "It only looks bigger, the stars are actually much, much bigger than the moon." Athena is surprised. She points to the sky and says, "See for yourself. The moon is much bigger."

Given your New Year resolution, how would you respond to Athena?

## 9.3 Types of Justification

The terms *evidence*, *argument*, and *proof* carry different shades of meaning, but they all come under the rubric of justification.

### 9.3.1 Evidence

'*Evidence*' refers to observations or observational reports as the grounds for justification. Observations include things we pick up through our senses: a noise we hear, a distinct smell, a broken window, or a blood-stained knife submitted to a court of law. A photograph of stars taken by an astronomer, measurements recorded by a physicist, an interview conducted by a sociologist,

the words in a literary text that a literary critic draws attention to, and an ancient scroll discovered by a historian that serves as the basis for a claim — all these are forms of evidence.

We must point out that *data* become evidence only when connected to a conclusion and used as the grounds for justification. For a historian, a set of newspaper reports on World War II, say, from 1944, is only data. It becomes evidence only when used as the grounds for a conclusion on WWII.

So far, all the grounds in our examples of justification have been instances of evidence. Let us now turn to justification where the grounds don't fall under the category of evidence. Suppose someone makes the following assertions: [What follows is familiar ground for you, from Reading B, LT4.]

- (1) My grandmother never had any children.
- (2) My grandmother was born when I was five years old.
- (3) My grandmother was a rabbit.
- (4) My grandmother's sisters never had any children.

Let us assume that the term 'grandmother' in all these examples refers to a *biological maternal grandmother*. Even if we don't know anything about the speaker or her/his grandmother, we would reject assertions (1)-(3) as false. In contrast, we are not in a position to judge the truth of (4). On what basis did we conclude that (1)-(3) are false? And why can't we determine the truth of (4)?

Here is a possible answer. Suppose we accept the following premises:

- (5) For any x, the proposition that x's grandmother never had children is false.
- (6) For any x, the proposition that x was 5 years old when x's grandmother was born is false.
- (7) For any x, if x is human, the proposition that x's grandmother was a rabbit is false.

From the *general* propositions in (5)-(7), it logically follows that the *particular* propositions (1)-(3) are false. In contrast, there is no premise from which we can deduce the truth or falsity of (4). Take the propositions in (8):

- (8) a. For any x, the proposition that x's grandmother's sisters never had children is false.  
b. For any x, the proposition that x's grandmother's sisters had children is false.

It is possible that a grandmother's sister has children (as (8a) claims), and it is equally possible that she doesn't have children (as (8b) claims). So, without evidence either way, we cannot arrive at a judgment on (4).

How about the statements in (5)-(7)? How do we know they are true? How do we justify these statements? We can prove that (5) is true simply by defining the concepts of mother, child, and (biological maternal) grandmother:

- (9) Definitions
  - a. Mother: y is the mother of x iff (iff = if and only if) y gave birth to x.
  - b. Child: x is a child of y iff y is a parent of x.
  - c. Grandmother: z is a grandmother of x iff z is the mother of y and y is the mother of x.

From (9c), it logically follows that:

- (10) For any z, if z is the grandmother of x, z has a child y who is the mother of x.  
Hence, for any x, the proposition that x's grandmother never had children is false.

By (10), (5) must be true. To prove (6), we need to add the following axioms (which we may take to be obviously true) to our definitions in (9):

- (11) Axiom:
  - a. A living organism x comes to exist when x is born.
  - b. For y to give birth to x, y must already exist.

From (11a, b), it follows that for x to exist (be born), the one who gives birth to x must exist. It then follows from (9a) and (11b), that for y to be the mother of x, y must exist before x can be born. This result, together with (9c), leads to the conclusion that, for z to be the grandmother of x, z

must exist before  $y$  can be born, and  $y$  must exist before  $x$  can be born. So, we can never have a situation where  $z$  is  $x$ 's grandmother, and  $x$  was five years old when (or even existed before)  $z$  was born. Hence, (6) is true.

To prove (7), we need to appeal to a general law that can be established on evidence (= observational grounds):

(12) If  $y$  is a parent of  $x$ , then  $x$  and  $y$  must belong to the same species.

From (12) and (9c), it follows that if  $z$  is a grandparent of  $x$ , then  $x$  and  $z$  belong to the same species. For any creature to utter the sentence, "My grandmother was a rabbit," the creature must be capable of speech. As far as we know, only a human being has that capacity for speech, along with an understanding of the sentence and the words in it. (A small number of parrots may be able to utter the words, but not with a conceptual understanding). Therefore, when a speaker says, "my grandmother", the grandmother too must be a human being. Given that a human being cannot be a rabbit, it follows that (7) is true.

As you can see, the proof of (5) is based purely on definitions of the relevant terms. The proof of (6) is based on definitions and axioms. These two proofs adopt the mode of proof in mathematics. The proof of (7) is based on definitions and a general law, which can be established on the basis of observations. It adopts the mode of proof in science.

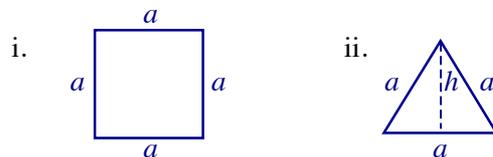
Let us go through one more example of justification that does not appeal to observational grounds. Here is an exchange between Zeno and Athena:

*Example: Squares and Triangles*

Z: Given a square, and an equilateral triangle whose sides are equal to the sides of the square, the area of the square is greater than the area of the triangle.

A: How do you know that?

Z: Imagine a square ((i)), and an equilateral triangle ((ii)) whose sides are equal to the sides of the square:



We know that if the sides of a square are of length  $a$ , its area is  $a \times a$ .

We also know that the area of a triangle is  $\frac{1}{2} b \times h$ , where  $b$  is the length of the base, and  $h$  is the height, the perpendicular from the base to the opposite angle. Since an equilateral triangle is defined as one whose sides are of equal length, all the sides of the triangle in (ii) are of length  $a$ . In an equilateral triangle whose sides are equal to that of our square,  $b = a$ , and its area is  $\frac{1}{2} a \times h$ .

A: Okay...

Z: In the equilateral triangle,  $h$  forms one side of two right-angled triangles. The hypotenuse of both these triangles is  $a$ . Hence,  $h$  is shorter than  $a$ . Hence, the area of the triangle, which is  $\frac{1}{2} a \times h$ , is definitely less than the area of the square, which is  $a \times a$ .

A: Oh yes, I see that now.

In this example, the grounds are:

- (i) the area of a square with sides of length  $a$  is  $a \times a$ ;
- (ii) the area of a triangle is  $\frac{1}{2} b \times h$ ; and
- (iii) the height of an equilateral triangle is less than its sides.

These grounds are results already proved in mathematics by appealing to *axioms* and *definitions*. Neither of these are forms of 'evidence'. However, the proof here is a form of justification.

### 9.3.2 Argument

An *argument* involves a *chain of reasoning* that connects the grounds to a conclusion. The extended reasoning that Zeno gives to justify his claim (that the dead man in the well was murdered) makes it an argument. The justification above (of the area of a square with sides  $a$  being greater than the area of an equilateral triangle with sides  $a$ ) is also an argument.

In contrast, there is no need for reasoning in Zeno's justification for the number of toes on his right foot, so we don't call it an argument. As for the example of body volume, Zeno's justification for his claim requires the interpretation of a measurement within a model: it doesn't require a chain of reasoning.

The concept of *argument* described here is quite different from the everyday meaning of argument, as in: "They were arguing all night, their loud voices disturbing their neighbours."

'Arguments' in such contexts are often *expressions of disagreement*, without necessarily presenting evidence and reasoning in support of the positions. This activity does not qualify as argument in rational inquiry.

Another meaning of the term argument, popular in the humanities, is that of an *extended elucidation of a claim*, not necessarily supported by evidence and reasoning. In such cases, the statement: "I argue that modernity is harmful," should be interpreted as: "I present the view, with details, that modernity is harmful." It is important to distinguish this meaning of 'argument' from the concept of argument as evidence and reasoning in support of a conclusion.

### 9.3.3 Proof

The term *proof* can be used in a restrictive sense, to refer only to the kind of proofs that we find in mathematics. Or it can be used in a broader sense, to cover not only mathematical proofs but also legal proofs and experimental proofs, and even a demonstration. A *proof* is a form of justification that leaves a conclusion very little room for error or doubt. How much error or doubt a proof allows varies across domains; even within a domain, the degree of expected rigour may vary.

In a court of law, for instance, a proof is an argument that yields a conclusion with certainty beyond *reasonable* doubt. In contrast, we expect mathematical proofs to meet a more stringent criterion, namely, certainty beyond *any* doubt. (Whether or not actual proofs meet this criterion is a separate issue.) The justification offered in the earlier example of 'Square and Triangle' is a mathematical proof. The justification offered in the example of the drowned man is admissible as a legal proof, but it does not satisfy the more stringent criterion of mathematical proofs.

#### EXERCISE 2

Consider a rectangle and a non-rectangle parallelogram whose corresponding sides are equal. Here are three possibilities:

- (a) They have the same area.
- (b) The area of the rectangle is greater than that of the parallelogram.
- (c) The area of the parallelogram is greater than that of the rectangle.

Which of the above is true? Can you prove it?

Examples 3 and 4 below are somewhat challenging. But it is still worth engaging with them, and trying to articulate your positions. The process, we hope, will force you to think outside your comfort zone, and help you expand your horizon.

### **EXERCISE 3**

Justice demands that all human beings be treated equally, regardless of their race, ethnicity, gender, economic status, religion, etc. Does the criminal justice system – as it exists today – have elements of injustice? For instance, does it have an unjust bias against the poor? Does it discriminate against powerless minorities? Formulate your position and justify it, paying attention to the following points.

- The criminal justice system identifies certain actions as criminal offenses, and punishes the offenders with imprisonment, and in extreme cases, death.
- Good defense lawyers charge high fees. Excellent defense lawyers charge even higher fees.
- Laws are created by those in power, even in a country where everyone has the opportunity to vote.
- Politics in most election-based democracies demands that rulers pay attention to the wishes of the majority, but not necessarily to moral integrity.

### **EXERCISE 4**

Has India been becoming more developed during the last fifty years? There are three logical possibilities:

- a) It has become more developed.
- b) It has become less developed.
- c) The level of development has remained the same.

Which of these possibilities do you think is the actuality? How would you gather the relevant data/information to prove/justify your claim?

To prove any of these claims, we need to (i) define development, (ii) set up clear criteria to measure the different parameters of development, and (iii) find ways to arrive at an overall number that serves as the index of development. To do this, you would need to think through different concepts of development.

If you ask someone, “What do you do for a living?” and (s)he says “I am a developer,” the concept of development implicit in the answer is that of real estate development. According to Wikipedia, “Developers buy land, finance real estate deals, build or have builders build projects, create, imagine, control and orchestrate the process of development from the beginning to end.”

Clearly, this is not the concept of development that governments seem to have. In January 2014, for instance, Narendra Modi identified five core parameters of development: growth of industry; education, and skilled manpower; small-scale industries and health sector; value addition; and purchasing power. This appears to be concept of the development of industry-economy in a country, where the purpose of education is primarily to serve the industry’s needs of skilled manpower.

A somewhat different conception of development is presented in the definition of development by the United Nations (<http://goo.gl/0dWQxB>).

Yet another concept is that of ‘development as freedom,’ proposed by Amartya Sen in 1998. ([http://en.wikipedia.org/wiki/Development\\_as\\_Freedom](http://en.wikipedia.org/wiki/Development_as_Freedom))

To prove your conclusion on development in India, you will have to make up your mind about which of these (or some other) concepts of development you would subscribe to.