

## ❖ *Evaluating Arguments* ❖

### 1.7. Convincing Arguments: Two Requirements

“Whether he was right to take that attitude is not the question we have to consider at the present moment. The point, for us, is that he was at least being logical: if you grant someone’s premise, you have no right to reject what follows next.”

– Cicero, **Tusculan Disputations V**

“Logic has the important function of saying what follows from what.”

– Stephen Cole Kleene, **Mathematical Logic** p. 3

We turn at last to evaluation of arguments, asking what makes an argument good or bad. As we take an argument to be for something – convincing someone of its conclusion – we take the goodness of an argument to turn on how well it serves this purpose. Argument evaluation is then a matter of whether or not an argument is **convincing**. And by “convincing” we’ll mean: **ideally convincing**, to an (ideally) rational audience. That will amount to requirements for being a knock-down proof of the conclusion.<sup>1</sup>

Working out principles of evaluation means determining the ingredients necessary to be an (ideally) convincing argument. We’ll settle here on two – one quite obvious, the other somewhat subtler.

**1. The First Requirement: Truth.** As the following argument illustrates, one essential ingredient for being a convincing argument is apparent.

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<sup>1</sup> That’s a standard we don’t always meet in everyday discussion. But precise standards aren’t rendered useless simply because ordinary practice doesn’t always meet them (or on occasion even *aim* to meet them) – just as in mathematics we don’t revise our view of what  $12.8 + 6.7$  equals in light of our sometimes forgetting to carry the 1, or our occasional willingness to accept an approximation rounded to whole numbers.

### Argument A

1. Benjamin Franklin was born in Boston.
  2. Benjamin Franklin was the first U.S. president.
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∴ The first U.S. president was born in Boston.

There's something undeniably pretty about this argument: its parts fit together so nicely, like clockwork, that it seems very **logical**. But our question here is whether the argument is **convincing**. Does the argument convince you that the first U.S. president was born in Boston?

If you know even a little U.S. history you'll remain unconvinced by this argument, since – despite that second premise's claim to the contrary – Benjamin Franklin was **not** in fact the first U.S. President. The second premise is **false**.

In general, an argument with one or more false premises will not make a convincing case for its conclusion. No surprise there: since the premises are what do the convincing, the whole attempt to convince blows up on the launchpad if one or more premises are recognized as false.

This is the first requirement for an (ideally) convincing argument.

#### 1. The premise(s) must be true.

Now, if true premises were the only requirement for a convincing argument, logical life would be simple indeed. For then to decide whether an argument is convincing we'd need only determine whether the premises were all true. But life is not so simple – as Argument B illustrates.

### Argument B

1. Dinosaurs lived before humans.
  2. The Pacific Ocean is larger than the Atlantic Ocean.
- 

∴ The first U.S. president was born in Boston.

Rational people generally agree that Argument B is among the unconvincing arguments about presidential birthplaces. Indeed, the argument seems plainly absurd. Yet for all its failings, we have to credit Argument B with at least this virtue: **all its premises are true**.

Since all the premises of Argument B are true while the argument remains (strikingly) unconvincing, we see that true premises are **not the only requirement** for being a convincing argument.

**2. The Second Requirement: Validity.** A noteworthy fact about Argument B is that the premise and conclusion discuss completely different topics. So a reasonable guess about the missing further requirement would be that the premise and conclusion must discuss the same subject matter.

That's typically true. But ultimately we'll take such a radical swerve in subject matter as only a symptom of a deeper problem.

Argument C shows why.

### Argument C

1. Benjamin Franklin was born in Boston.
2. Benjamin Franklin was **not** the first U.S. president.

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∴ The first U.S. president was born in Boston.

All the premises of Argument C are true, **and** those premises discuss the same topic as the conclusion. Yet Argument C still doesn't convince us of its conclusion. Hence meeting the 'no change of subject matter' requirement, even together with the true premises requirement, doesn't ensure a convincing argument.

Intuitively, the failings of Arguments B and C are the same: while both have true premises, in each case those premises don't provide anything like **adequate reasons for believing the conclusion**. An argument which convinces us of its conclusion is an argument providing reasons to believe that conclusion to be true – ideally, **reasons sufficient to ensure a true**

**conclusion.** It's the nature of such **sufficient evidence** that its truth brings truth of the conclusion in its wake. That is: when premises **do** provide sufficient grounds for believing the conclusion, we believe the conclusion once we believe those premises.

That's clearly a standard Arguments B and C fail to meet, since with these arguments we believe the premises but still **don't** believe the conclusion. However true the premises of these arguments, those true premises don't provide **evidence sufficient to ensure a true conclusion.**

That shortcoming highlights the missing second requirement for a convincing argument. Not only must the premises be true (the first requirement), those true premises must furthermore be **sufficient to guarantee truth of the conclusion.** If an argument has this second feature, we'll find that whenever its premises are true its conclusion is true as well. And we mean "whenever" in the strongest terms: **true premises guarantee true conclusion, without exception.**

An argument where premises and conclusion are linked in that way is a **valid argument.**

**Valid argument:** an argument where true premises would guarantee a true conclusion

(*In other words:* an argument where the conclusion *must* be true if the premises are true.)

(*In yet other words:* an argument where it's impossible to have true premises without also having a true conclusion)

Likewise "**validity**" means *being valid* – just as solidity is *being solid*, conductivity is *being conductive*, and so on.

Validity turns out to be precisely what Arguments B and C are lacking.

### Argument B

1. Dinosaurs lived before humans.
  2. The Pacific Ocean is larger than the Atlantic Ocean.
- 

∴ The first U.S. president was born in Boston.

If Argument B were valid, its conclusion would be true whenever its premises were – **without exception**. But in fact Argument B allows plenty of exceptions.

In the actual world, the premises of Argument B are true. But it's false in the actual world that the first U.S. president was born in Boston. (The first U.S. president was George Washington, who was born in Westmoreland County, Virginia.) Thus the world before our eyes provides a case where the conclusion of Argument B is **not** true, even though its premises are. And that shows that true premises in Argument B do **not** guarantee a true conclusion. Argument B isn't valid – it's **invalid**.

Argument C is likewise invalid.

### Argument C

1. Benjamin Franklin was born in Boston.
  2. Benjamin Franklin was **not** the first U.S. president.
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∴ The first U.S. president was born in Boston.

Here again the premises are true but the conclusion false; so true premises don't guarantee a true conclusion in C (as they would in a valid argument).

But evidence that an argument is invalid isn't always sitting conveniently before our eyes. Sometimes to see that an argument is invalid we need to consider other possible situations – situations other than the way things actually are.

Argument D is a case in point.

### Argument D

1. Dinosaurs lived before humans.
  2. The Pacific Ocean is larger than the Atlantic Ocean.
- 

∴ The first U.S. president was born in Westmoreland County, Virginia.

Both the premises and the conclusion are actually true. But that doesn't make Argument D valid. For an argument to be valid, true premises have to **always** be accompanied by a true conclusion – not just in one lucky case. So we ask: is it even **possible** for the premises of D to be true, without the conclusion being true?

Sure: if John Adams had won that first election, it would have been *false* that the first U.S. president was born in Westmoreland County, Virginia (since Adams was born in Braintree, Massachusetts). It's certainly possible for dinosaurs to have preceded humans in history, and for the Pacific to be larger than the Atlantic, in a situation where Adams won the election. That possible situation would be one where the **premises** of D were **true**, but the **conclusion false**. Since it's possible for Argument D to have true premises without a true conclusion, Argument D is **invalid**.

Validity turns out to be a high hurdle for an argument to clear, since it requires that true conclusion accompany true premises with no **possible** exception. As Argument D shows, it's not enough that true premises are **actually** accompanied by true conclusion – if it's even **possible** for an argument to have true premises without true conclusion, that argument is invalid. A valid argument is one where premises provide an ideal level of support for the conclusion – where the premises provide a knock-down **proof** of the conclusion.

To see that validity doesn't set an *impossibly* high hurdle, we turn again to Argument A.

### Argument A

1. Benjamin Franklin was born in Boston.
  2. Benjamin Franklin was the first U.S. president.
- 

∴ The first U.S. president was born in Boston.

This argument tripped over the True Premises requirement. But it fares better in terms of validity: intuitively, in any situation where both those premises *were* true, the first U.S. president would **have to** have been born in Boston. Put the other way around: it seems **impossible** for both the premises of this argument to be true, yet for the conclusion to somehow still be false. And that's just what it takes to be a valid argument. Argument A is **valid**. (Validity, it turns out, is the lovely 'clockwork' feature in A that we noticed earlier.)

The way **validity** and **true premises** fit together provides an even lovelier piece of clockwork. For an argument meeting both requirements – a valid argument, with true premises – provides both of the following.

(i) *If* the premises are true, *then* the conclusion's also true

and

(ii) the premise *are* true.

Together these two conditions guarantee that the conclusion is true. And that's just what we look for in an ideally convincing argument: an argument providing evidence sufficient to *prove* its conclusion is true.

So we take validity to be the missing second requirement for a convincing argument.

### Requirements to be a Convincing Argument:

1. The premise(s) must be true.
2. The argument must be valid.

Note that these two factors are independent: neither brings the other in its wake. As Argument A shows, **a valid argument can have false premises.**

### Argument A

1. Benjamin Franklin was born in Boston.
2. Benjamin Franklin was the first U.S. president.

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∴ The first U.S. president was born in Boston.

Being valid is merely a matter of “if”: **if** the premises of a valid argument *were* true, its conclusion would be true as well.

And as Arguments B, C, and D show, **an invalid argument can have (all) true premises.** Since neither of the two factors brings the other, our list of ingredients for a convincing argument can’t leave out either.

Finally: for all its seeming technicality, the concept of validity largely parallels the familiar notion of **following from**.<sup>2</sup>

For instance, Argument A is a **valid** argument. And note that its conclusion follows from its premises: though we take the second premise to be false, still we say that if it *were* true that Benjamin Franklin had been the first U.S. president and had been born in Boston, it would indeed **follow** that the first president was born in Boston.

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<sup>2</sup> Though with this subtle variation: in everyday usage we tend to say the conclusion “**follows from**” the premises when we also take those premises to be true; but say the conclusion “**would follow**” when we’re not assuming the premises are true. But it’s not easy to describe that second option in everyday English (because ordinary speech doesn’t let us sum up validity as “the feature of **would-following from**”). The closest we get in ordinary language is equating validity with **following from**.



By contrast, Arguments B, C, and D were all deemed **invalid**. And we agree that in each argument the conclusion **does not follow** from the premises.

(B)	(C)	(D)
1. Dinosaurs lived before humans. 2. The Pacific Ocean is larger than the Atlantic Ocean.	1. Benjamin Franklin was born in Boston. 2. Benjamin Franklin was not the first U.S. president.	1. Dinosaurs lived before humans. 2. The Pacific Ocean is larger than the Atlantic Ocean.
<hr/> ∴ The first U.S. president was born in Boston	<hr/> ∴ The first U.S. president was born in Boston	<hr/> ∴ The first U.S. president was born in Westmoreland County, Virginia.

While we'll later note occasions where this connection is strained, we'll see many more cases illustrating the close parallel between **validity** and '**following from**'.

(As a bit of stylistic variety, we'll also sometime discuss facts about following from in terms of **entailment**: if the conclusion follows from the premises, then the premises **entail** the conclusion. So: a valid argument is one whose premises entail its conclusion.<sup>3</sup>)

Taking validity as a more technical counterpart of old-fashioned 'following from,' we could restate our two requirements as follows.

### Requirements to be a Convincing Argument (Alternate Phrasing):

1. The premise(s) must be true.
2. The conclusion must follow from those premises.  
*(Those premises must entail the conclusion.)*

Those requirements seem quite reasonable: the truest premises in the world are of no help to an argument if the conclusion doesn't follow from them; and neither are we convinced of a conclusion by seeing that it follows from a

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<sup>3</sup> The relation between **following from** and **entailing** is like the relation between buying and selling. The sentences "Rex bought peeled shrimp from Dr. Slim" and "Dr. Slim sold peeled shrimp to Rex" describe the same transaction, but from different points of view: in terms of what Rex did (buying) and what Dr. Slim did (selling). Likewise in a valid argument: **following from** is what the **conclusion** does (to the premises), while **entailing** is what the **premises** do (to the conclusion).

pack of lies. The reasonableness of these two requirements is more evidence that our list is getting it right.

**3. Conclusion: Logic as the Science of Validity.** Having stressed the independence of these two requirements, and the indispensability of each, it could come as a surprise to find that logic devotes no real effort to testing premises for truth, instead focusing almost exclusively on tests of validity.<sup>4</sup>

That's a simple matter of which investment of time and labor is likely to yield results. To build a full-proof test for true premises – say, a computer that could consider any premise whatsoever and decide if it's true or false – we'd need to know **everything**. Since it's not likely we'll ever be in a position to construct such an all-knowing computer, a full-proof test for true premises looks like a pipe dream.

By contrast, logicians have had considerable success building general tests of validity. And for that reason alone we'll find it fruitful in logic to focus on validity.

With that in mind, we can sharpen our original understanding of logic as 'the study of arguments'. More precisely: **logic is the study of validity** – the science of **what follows from what**.

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<sup>4</sup> Our formal methods will establish the actual truth or falsehood of a sentence only as a side-effect of determining whether the sentence is true in **every possible** situation, or false in in **every possible** situation (see 2.17). But even there formal logic takes no special interest in the actual state of affairs.

### Summary: Truth, Validity, and Convincing Arguments

- Two requirements for an ideally **convincing** argument:
  1. The **premises** of the argument must **all** be **true**.
  2. The **argument** must be **valid**.  
*(Informally: the conclusion must **follow from** the premises.)*
- **Valid argument:** an argument where true premises (would) guarantee a true conclusion  
*(In other words: an argument where it's impossible to have true premises without a true conclusion)*