LOGIC, ARGUMENT, AND REASONING

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LOGIC, ARGUMENT, AND REASONING

Outline

1. WHAT IS LOGIC?
2. ARGUMENT AND REASONING
3. REASONING AND LOGIC
4. ARGUMENT AND LOGIC
5. LOGIC IS...

Logic will get you from A to B.
Imagination will take you everywhere.

- Albert Einstein
What is Logic?
1. What is Logic?

What is logic?

I confess, however, that I am unable to give any clear account of what is meant by the phrase “true in virtue of its form.” But this phrase, inadequate as it is, points, I think, to the problem which must be solved if an adequate definition of logic is to be found.

Bertrand Russell, *The Principles of Mathematics* 1903
What is logic?

I confess, however, that I am unable to give any clear account of what is meant by the phrase “true in virtue of its form.” But this phrase, inadequate as it is, points, I think, to the problem which must be solved if an adequate definition of logic is to be found.

Bertrand Russell, *The Principles of Mathematics* 1903

It is far from clear what is meant by logic or what should be meant by it.

Jaakko Hintikka and Gabriel Sandu, *What is Logic?* 2006
1. What is Logic?

What is logic?

Google: about 375,000,000 results (0.13 seconds)
1. WHAT IS LOGIC?

Logic is the study of the methods and principles used to distinguish good (correct) from bad (incorrect) reasoning.
Logic, Argument, and Reasoning

1. What is Logic?

Logic is the study of the methods and principles used to distinguish good (correct) from bad (incorrect) reasoning.

Logic is the study of argument.
**LOGIC, ARGUMENT, AND REASONING**

1. **WHAT IS LOGIC?**

   Logic is the study of the methods and principles used to distinguish good (correct) from bad (incorrect) reasoning.

   Logic is the study of argument.

   Logic, *strictly speaking*, is the science or study of how to evaluate arguments and reasoning.
LOGIC, ARGUMENT, AND REASONING

1. WHAT IS LOGIC?

These are changing times for logic, as the subject is studied and taught in philosophy departments...
It has become questionable whether there are any longer clear and appropriate definitions of the key terms 'reasoning' and 'argument' with which we can work.

Douglas N. Walton

WHAT IS REASONING? WHAT IS AN ARGUMENT?
Argument and Reasoning
What is reasoning?

Reasoning is a special mental activity called *inferring*, what can also be called making (or performing) *inferences*.

Gary M. Hardegree, *Symbolic Logic: A First Course*.

All reasoning is thinking but not all thinking is reasoning – special kind of thinking in which *inference* takes place.

Irvin M. Copy

It is far from clear what is meant by logic or what should be meant by it. It is nevertheless reasonable to identify logic as the study of *inferences* and *inferential relations*.

Jaakko Hintikka and Gabriel Sandu, *What is Logic?*
What is reasoning (and inferring)?

In the sense to be recommended, the verb ‘infer’ is used for the epistemic activity of [a person] judging a proposition to be true by determining that it is a consequence of given propositions known to be true.

John Corcoran, *Meanings of Inference, Deduction, and Derivation*

Inference and reasoning are psychological processes leading to possible changes in belief (theoretical reasoning) or possible changes in plans and intensions (practical reasoning).

Gilbert Harman, *Internal Critique*. 
What is reasoning (and inferring)?

Reasoning is the process of inference; it is the process of passing from certain propositions already known or assumed to be true, to another truth distinct from them but following from them.

Dagobert D. Runes, *Dictionary of Philosophy*

Reasoning is the making or granting of assumptions called premises (starting points) and the process of moving toward conclusions (end points) from these assumptions by means of warrants.

Douglas N. Walton, *What is Reasoning?*
LOGIC, ARGUMENT, AND REASONING

2. ARGUMENT AND REASONING

What is argument?

An argument is a collection of statements, one of which is designated as the conclusion, and the remainder of which are designated as the premises.

Gary M. Hardegree, Symbolic Logic: A First Course

An argument, in the logician's sense, is any group of propositions of which one is claimed to follow from the others, which are regarded as providing support or grounds for the truth of that one.

Irvin M. Copy
What is argument (and reasoning)?

For the purposes of logic, an argument is not a quarrel or dispute, but an example of reasoning in which one or more statements are offered as support, justification, grounds, reasons, or evidence for another statement. The statement being supported is the conclusion of the argument, and the statements that support it are the premises of the argument.

Peter Suber, Basic Terms of Logic
What is argument (and reasoning)?

An argument is a *publicly expressed tool of persuasion*. Typically it takes thinking to construct an argument. Reasoning is distinguished from arguing along these lines: reasoning is what you may do before you argue, and your argument expresses some of your (best) reasoning. But much reasoning is done before and outside the context of argument.

Trudy Govier, *Critical Thinking as Argument Analysis?*
LOGIC, ARGUMENT, AND REASONING

2. ARGUMENT AND REASONING

Summing up

**Reasoning** – is a mental (cognitive, epistemic) activity of (1) *inferring* and (2) *practical thinking*.

**Argument** – is a complex of statements (propositions) designated as premises and conclusion ordered by an implication relation.
Reasoning and Logic
Is logic really a science of reasoning?

No!
LOGIC, ARGUMENT, AND REASONING

3. REASONING AND LOGIC

Why logic is not a science of reasoning.

David N. Perkins, *Standard Logic as a Model of Reasoning: the Empirical Critique*

*Do* people reason according to standard logic?

*Can* people reason according to standard logic?

*Should* people reason according to standard logic?
3. REASONING AND LOGIC

Why logic is not a science of reasoning.

*Do* people reason according to standard logic?

People do endorse what logically does not follow from given premises and do not endorse what follows.
Why logic is not a science of reasoning.

People do not reason according to standard logic.

People do endorse what logically does not follow from given premises and do not endorse what follows.

Example: Modus Tollens.

- Denying antecedent – up to 73%!
- Affirming the consequent – up to 75%!

J. St.B. T. Evans et al., *Human Reasoning: the psychology of deduction*
LOGIC, ARGUMENT, AND REASONING

3. REASONING AND LOGIC

Why logic is not a science of reasoning.

*Can* people reason according to standard logic?
Why logic is not a science of reasoning.

People cannot reason according to standard logic because of their physical limits.

- Limits of computation
- Limits of intelligence
- Limits of understanding
3. REASONING AND LOGIC

Why logic is not a science of reasoning.

People cannot reason according to standard logic because of their physical limits.

• Limits of computation
• Limits of intelligence
• Limits of understanding

\[
\text{Not (A and B)} \equiv \text{Not (A or B)} \equiv \text{Not A and Not B}
\]
Logic, Argument, and Reasoning

3. Reasoning and Logic

Why logic is not a science of reasoning.

Should people reason according to standard logic?
LOGIC, ARGUMENT, AND REASONING

3. REASONING AND LOGIC

Why logic is not a science of reasoning.

People should not reason according to standard logic.

• Standard logic is contrived.  (Modus Tollens reconsidered)

• Standard logic is overgeneral.  (logic is impractical)
LOGIC, ARGUMENT, AND REASONING

3. REASONING AND LOGIC

That is why logic is not a science of reasoning.
Argument and Logic
**4. ARGUMENT AND LOGIC**

**Argument** – is a complex of statements (propositions) designated as premises and conclusion ordered by an implication relation.

Argument is an objective presentation of reasoning trails.
4. **Argument and Logic**

**Argument** – is a complex of statements (propositions) designated as premises and conclusion ordered by an implication relation.

Argument is an objective presentation of reasoning trails.

Thus,

Argument is reasoning articulated in language.
It is a linguistically expressed reasoning.
4. ARGUMENT AND LOGIC

Argument and language

Logic is a normative science of forms, laws and methods of

*intellectual cognitive activity*.

V. Bocharov and V. Markin, *Introduction to Logic*

*Intellectual cognitive activity* is any activity carried out by

means of language.

B & M, *Introduction*...
Why logic is not a science of argument.

Argument and language

First objection:
If argument is a correlate of reasoning, the definition of logic as a study of argument inherits all above criticism.
**ARGUMENT AND LOGIC**

Argument and language

Pre-verbal and non-verbal reasoning:

- I. P. Pavlov: word as a signal of signals and language as the second-signal system.
- L. I. Orbeli: the ontogenetic development of language.

Hypotheses about intermediate stages of signal systems evolution and pre-verbal (proto-verbal) concepts.
L. S. Vygotsky’s main ideas:

1. Thought and speech have different genetic roots. Thought has a pre-verbal root and speech has a pre-intellectual root.

2. Progress in thought and progress in speech are not parallel. The two functions develop along different lines and independently of each other.
Argument and language

L. S. Vygotsky’s main ideas:

3. There is no clear-cut and constant correlation between them.
   In the phylogeny of thought and speech, a pre-linguistic phase in the development of thought and a pre-intellectual phase in the development of speech are clearly discernible.
4. ARGUMENT AND LOGIC

Argument and language

Anna Wierzbicka: semantic primes and universals

All humans possess as part of their inherited human faculties the same basic relatively small set of innate *semantic primes* (*semantic primitives*).
4. ARGUMENT AND LOGIC

Argument and language

Animals: rational behavior

- higher animals (subhuman primates, corvid, dolphin) have the ability to reason and making inferences.

‘Transitive Inference’

\[ aRb, bRc \Rightarrow aRc \]

Empirically tested and proved!
Argument and language

Animals: rational behavior

• higher animals (subhuman primates, corvid, dolphin) can reason and make inferences.
• the reason for this is that they have the cognitive ability of non-verbal reasoning,

*which adds further credence to conjectures of Vygotsky, Orbeli, and Wierzbicka.*
Why logic is not a science of argument.

Argument and language

Second objection:
If reasoning (and making inference as its core) is an innate non-verbal ability of all rational animals, the definition of logic as a study of argument is too narrow.
4. ARGUMENT AND LOGIC

Summing up:

1. Argument is a (verbal) correlate of reasoning;
2. Inferring is an innate non-verbal ability of all rational animals.

Hence,

Logic is not a science of argument!
Logic is...
5. Logic is...

Logic is neither science of reasoning nor study of argument

What is logic?
5. Logic is...

1. Logic as a theory of implication

➢ Bertrand Russell, *The theory of implication* (1906)
5. Logic is...

1. Logic as a theory of implication

   - Bertrand Russell, *The theory of implication* (1906)

   - Karl Popper, *New foundations for logic. The trivialization of mathematical logic* (1947-49)

Logic as a metalinguistic theory of implication relations.
5. Logic is...

1. Logic as a theory of implication

- Bertrand Russell, *The theory of implication* (1906)
- Karl Popper, *New foundations for logic. The trivialization of mathematical logic* (1947-49)

5. Logic IS...

1. Logic as a theory of implication

The kind of Structuralist Logic that I have in mind begins with *implication structures*, those ordered pairs consisting of a non-empty set, together with an *implication relation* on it...

There may be many different implication relations, and the results for each of the operators can nevertheless look very different, given a difference in the implication relation.

5. Logic is...

1. Logic as a theory of implication *(summing up)*

Implication is a relation between appropriate non-linguistic meaning-entities (or truth-bearers).
5. Logic is...

2. Logic as a science of truth (values)

➤ Gottlob Frege, *The Thought (1918)*

The task of logic is to discern the laws of truth and it has the truth as its subject-matter.
LOGIC, ARGUMENT, AND REASONING

5. LOGIC IS...

2. Logic as a science of truth (values)

• Gottlob Frege, *The thought* (1918)

➢ Jan Łukasiewicz, *Two-valued logic* (1921)

Logic is the science of objects of a special kind, namely a science of *logical values*
2. Logic as a science of truth (values)

- Gottlob Frege, *The thought* (1918)
- Jan Łukasiewicz, *Two-valued logic* (1921)
- Yaroslav Shramko, *Logic and values* (2013) *(to be listen to)*

Logic should be properly seen as the science of these (*logical/truth*) values.
5. Logic is...

2. Logic as a science of truth (*summing up*)

Logical values are

- abstract
- singular

entities like numbers (2 or 4).

Ontologically,

- truth has its analogue in being,
- falsehood, in non-being.
5. Logic is...

1-2. Logic is... a science of truth or/and implication?

Truth-makers and truth-bearers.

Implication is a relation between *truth-bearers*.
LOGIC, ARGUMENT, AND REASONING

5. LOGIC IS...

1-2. Logic is... a science of truth or/and implication?

Truth-makers and truth-bearers

Implication is a relation between truth-bearers.

Lukasiewicz (On the Principle of the Excluded Middle, Logic and Psychology):

• Propositions as Meinong’s objectives;
• Logic investigates objective correlates of judgments, i.e. objectives
5. Logic is...

1-2. Logic is... a science of truth or/and implication?

Act/product theory

Stumpf, Twardowski, Stanislaw Ossowski (1907, 1912, 1926)
5. **Logic is...**

1-2. Logic is... a science of truth or/and implication?

**Act/product meaning theory**

Stumpf, Twardowski, Stanislaw Ossowski (1907, 1912, 1926)
LOGIC, ARGUMENT, AND REASONING

5. LOGIC IS...

1-2. Logic is... a science of truth or/and implication?

Language and sense
5. **Logic is...**

1-2. Logic is... a science of truth or/and implication?

Language and sense

No intension without expression!
5. Logic is... a science of truth or/and implication?

Sense-entites:
- abstract
- prior to their linguistic expression
- inhabits the ‘third realm’, ordered by special relations between sense-entites and their complexes
5. Logic is...

1-2. Logic is... a science of truth or/and implication?

Husserl: a tree of senses with vertical (inclusion) relations and lateral (between points on different branches) relations.
Logic, Argument, and Reasoning

5. Logic is...

1-2. Logic is... a science of truth or/and implication?

Husserl: a tree of senses with vertical (inclusion) relations and lateral (between points on different branches) relations.

“If all gravitating masses were destroyed, the law of gravitation would not thereby be suspended: it would merely remain without the possibility of factual application. For it tells us nothing regarding the existence of gravitating masses, but only about that which pertains to gravitating masses as such.”
5. **Logic is...**

1-2. Logic is... a science of truth or/and implication

Logic as a science of implication (between abstract sense-entities)
Logic is... a science of truth or/and implication?

Sense-entities:

- abstract
- prior to their linguistic expression
- inhabits the ‘third realm’, ordered by special relations between sense-entities and their complexes
- are not given in any particular actual perception
5. Logic is... a science of truth or/and implication?

Language is the only perceptually apprehendable mediator between human consciousness and sense-entities!
5. Logic is...

1-2. Logic is... a science of truth or/and implication?

Language is the only perceptually apprehendable mediator between human consciousness and sense-entities!

‘and swam if never apple knock’ – “the impossibility is rather objective, ideal, rooted in the pure essence of meaning realm”

Husserl
5. Logic is...

1-2. Logic is... a science of truth or/and implication?

Language is the only perceptually apprehendable mediator between human consciousness and sense-entities!

**Argument** is a collection of statements describing inferential connection, which is a particular case of higher-order relationship between sense-entities.
5. Logic is...

1-2. Logic is... a science of truth or/and implication

Logic as a science of implication (between abstract sense-entities)

Logic is a science of truth-values
5. Logic is...

All of you are right. The reason every one of you is telling it differently is because each one of you touched the different part of the elephant. So, actually the elephant has all the features you mentioned.

Elephant and the blind men.  
*Jain Stories.*
"What is to be done" amounts to re-thinking what logic is about!

My view of logic suggests that we are on the threshold of a new agenda for the discipline as a study of reasoning, information and communication. This may be seen as a return to broader pre-Fregean ambitions, with the mathematical tools provided by the 'contraction phase' of foundational research. I would hope that this process will again produce major fundamental insights, comparable to those of the Golden 1930s.

Johan van Benthem
logic is...

all around!