

The Appeal to Reason

Introductory Logic pt. 1

Argument vs. Argumentation

- The difference is important...as demonstrated by these famous philosophers....

The Origins of Logic: (highlights)

- Aristotle (385-322 B.C.E.)
 - Develops logic which remains relatively unchanged for nearly 2000 years, with some changes along the way. Specifically: the syllogism.
 - Recognized that all sciences begin from certain postulates and axioms, explicitly stated. States “laws of thought” at foundation of logic.

The Origins of Logic (highlights)

- Aristotle's "laws of thought"
 - the law of identity ($A=A$),
 - the law of non-contradiction (A does not equal $\sim A$),
 - and the law of the excluded middle (either A or not A but not both A and $\sim A$).
- Are these laws simply "laws of thought?"
what other options?

The Origins of Logic (highlights)

- Plato had discussed affirmations and denials, and recognized the importance of syntax and grammar in argument in *The Sophist*
- Aristotle systematizes in the *Organon* which includes “Categories” and the “Prior and Posterior Analytics”

The Origins of Logic (highlights)

- For roughly 2000 years, the syllogistic is considered to be logic itself, and no substantial improvements are made.

- E.g:

All A is B

All B is C

Ergo All A is C

The Origins of Logic (highlights)

- *Theophrastus* discovers the hypothetical syllogism, and thus anticipates the logic of non-categorical propositions:
 - *If A then B*
 - *If B then C*
 - Thus, *if A then C*

The Origins of Logic (highlights)

- Indian and Chinese logic:
 - We should note that the Chinese (Buddhist) and Indian (Hindu) traditions developed systematized grammars, syntax and rules of inference
- Arabic Logic: inherits Aristotle's and refines, including the innovation of the "null" set, and numerous other innovations on Aristotle's syllogistic

Problems with the Syllogism?

- What sorts of entities do “categorical” syllogisms deal with, and what sorts are omitted?
- Medieval logicians begin to deal with logic of material consequences.
 - E.g If p then q .
- Pitfalls of the syllogism, once again, by our philosopher friends...

Modern Logic

- Leibniz believes he can devise a completely universal, formal, logical language. Says logic is at heart mathematics
- Devises a logical algebra with 13 basic axioms
- Pascal believed these axioms could be the foundation for “reasoning” machines.

Modern Logic

- Father of modern logic may be Bolzano, who (like Aristotle) believes that the theory of logic is the theory of science. Claims all sentences are reducible to the form “a *has* b”
- Defines a proposition as logically analytic when all its descriptive constituent terms occur in it vacuously (anticipates Quine)
- Are there non-analytic propositions? Is that the realm of science?

Modern Logic

- Logically Analytic: all bachelors are non-married men (vs. “synthetic”)
 - Can you state a synthetic proposition?
- J.S. Mill and Bolzano do much to define inductive method.
 - Question: does analytic truth add information to the world?
 - If not, how is induction important to science?

Modern Logic

- By 19th and 20th c., Leibniz's vision of mathematizing logic had taken hold. This begins in earnest with Boole (1847) and then eventually Russell and Whitehead's *Principia Mathematica*
- Frege: 1848-1925, and then Wittgenstein who develops a truth-table method of evaluating validity... (which we will employ in our course)

Subject Matter of Logic

- What is logic about?
 - Words? “semantics/grammar”
 - Thoughts? “laws of thought”
 - Objects? “metaphysics”
- Is it a science, and if it is, what are its fundamental axioms, if any?
 - Keep asking yourself: what justifies accepting those axioms?

Pragmatism and Logic

- Pragmatism criticizes Aristotle's logic:
 - Syllogistic principles do not reflect the way the mind works truly
 - Formal logic tends to degenerate into verbal exercises regarding dialectical skills
- Is logic *a* science, a *part* of science, or something else? How does it relate, say, to mathematics?

Logic and Science

- Logic is not about the way we think or the way we reason (psychology)
 - Why not?
- Logic is not about the way the world works (physics)
 - Why not?
- Logic is the theory of inference

Logic and Science

- Logic helps rule out that which is absolutely impossible, and thus determines the field of what in the absence of empirical knowledge is abstractly possible
- Logic helps then to frame hypotheses essential in science

Logic and Science

- A theory of inference is necessary in all fields for attaining truth via the scientific method, as is a theory of induction
- Deductive reasoning enables us to discover what it is to which we must consistently commit ourselves if we accept certain propositions

Logic and Science

- A major role of deduction is the formulation of hypotheses. Mathematics and logic enable us to explore the possible outcomes of various hypotheses, and then we match experimental outcomes with predicted results.

Critical Thinking

Critical Thinking involves understanding and using various modes of language in accordance with various rules of thinking to form and analyze “arguments.”

- we use our critical thinking skills to develop convincing arguments and to discern whether the arguments of others are worthwhile.
- CT is a *part* of CI

We Must Understand:

- SYNTAX - relationships among symbols
- SEMANTICS - relationships of symbols to things in the world
- PRAGMATICS - relationships of language to the user of a language

There are fixed “rules of inference” that allow us to examine certain sentences and combinations of sentences and determine whether they offer good reasons to believe them or not.

We Must Understand:

- LOGIC - is the study of arguments and argument forms
- ARGUMENTS - are composed of a conclusion and one or more premises
- VALID ARGUMENTS - have conclusions which follow from their premises
- SOUND ARGUMENTS - are VALID arguments whose premises are also TRUE

Logic and The World

- Remaining questions:
 - What are the objects of logic?
 - What are the objects of mathematics?
 - How do they relate to each other, and to the objects of the real world?
- How do we account for abstract entities in science? In naturalism?

Logic and The World

- Are you a Rationalist?
- Or are you an empiricist?
 - What are the implications for each for the nexus between logic and the sciences?
- How do we get new information about the world?

Logic and The World

- Leibniz:
 - “Natural science is naught but applied mathematics”
(and logic, by extension)

Logic and The World

- Royal Society 1662.
 - “We feel certain that the forms and qualities of things can best be explained by the principles of mechanics, and that all effects of Nature are produced by motion, figure, texture, and the varying combinations of these; and that there is no need to have recourse to inexplicable forms and occult qualities, as to a refuge from ignorance”
 - Boyle to Spinoza

Logic and The World

- But... Boyle concluded from his observations:
 - “The world behaves as if there were diffused throughout the universe and intelligent being”
- Whereas Halley:
 - “the doctrines of Christianity are now inconceivable”

Logic and The World

- Why the divergence?
 - Stems from the fact that the laws of logic and mathematics are axiomatic and seemingly immutable... part of the firmament of nature itself
 - E.g law of non-contradiction, law of excluded middle, law of identity
 - Then what role for science and investigation?
 - Tests, constantly, this firmament.

The Appeal to Reason

Chap 1, Pt.2

Basic Assumptions of Critical Thinking

- EVERYONE is already skilled to a degree in the rational process of ANALYZING, DEFENDING and EVALUATING CLAIMS
- EVERYONE CAN IMPROVE these basic skills by becoming AWARE of PRINCIPLES behind them, and using them DELIBERATELY rather than instinctively
- THESE PRINCIPLES are IMPLICIT in ordinary practices of defending and evaluating claims - not invented

Basic Assumptions of Critical Thinking

- “Few persons care to study logic, because everybody conceives himself to be proficient enough in the art of reasoning already. But I observe that this satisfaction is limited to one's own ratiocination, and does not extend to that of other men.”
 - Source: Charles Sanders Peirce, "The Fixation of Belief", Popular Science Monthly 12 (November 1877), pp. 1-15.

Q: What is an ARGUMENT?

Definition: to make an ARGUMENT is to make a CLAIM and to OFFER other CLAIMS as reasons to accept it.

Definition: In other words - an ARGUMENT is a set of claims, one of which is meant to be SUPPORTED by the others

NOT AN ARGUMENT

“By the end of September in New England, the leaves are already changing, the nights are cooler and the days are noticeably shorter. Some start feeling a sense of dread thinking about the long winter ahead.”

Is this an ARGUMENT?

“Every person in the U.S. is entitled to a decent minimum level of the health care. But thousands must go without it because they cannot afford it. Clearly, then, justice demands that we change our health system.”

Is this an ARGUMENT?

“She’s armed, so she’s dangerous.”

Conclusion vs. Premise

CONCLUSION: a claim meant to be supported by reasons offered in the argument.

PREMISE: a claim put forth as a reason for a conclusion.

Definition: All **ARGUMENTS** can be divided into a conclusion (at least one) and one or more premises.

General Considerations

- Arguments can be of any length, occur in any context and regard any subject matter.
- Arguments are NOT MERE DISPUTES

General Considerations

- Arguments may fail for a number of reasons, including:
 - PREMISES may be FALSE or IRRELEVANT or fail to adequately SUPPORT conclusion
 - “It hasn’t rained in weeks. It is certain to rain tomorrow.”
 - May be of an invalid form

Recognizing Arguments

“Today is the 5th, yesterday was the 4th.”

Is this an argument?

Which is premise and which is conclusion?

Could be:

PREMISE:

Today is 5th

CONCLUSION:

Yesterday was

4th

Could be:

PREMISE:

Yesterday was

4th

CONCLUSION:

Today is 5th

Or:

Could be

totally

unrelated

observations

Inference Indicators

Examples:

So

Thus

Hence

Therefore

Consequently

It follows that

We can conclude that

This entails that

Unstated (implicit) Premises and Conclusions

Arguments with them are called
“enthymemes”

“The bigger the burger the better.
The burgers are bigger at Burger King.”

What is the unstated conclusion?

Unstated (implicit) Premises and Conclusions

“Herman cannot be the person who robbed the store because Herman does not have a snake tattoo on his left arm.”

What is the unstated premise?

Questions, Commands, Exclamations, and Exhortations

Because arguments are sets of CLAIMS,
certain sentences cannot comprise them:

- Questions
- Commands
- Exclamation
- Exhortations

Questions, Commands, Exclamations, and Exhortations

Some sentences must be
interpreted and not taken
literally to work as parts of an
argument

Questions, Commands, Exclamations, and Exhortations

Example: “Clouds are rolling in and the wind is picking up. Go check the boat now!”

What is the last sentence?

-to be a conclusion, how must we interpret it?

“You should go check the boat now!”

Multiple Conclusions and Complex Arguments

Some large arguments are composed of numerous smaller arguments.

Multiple Conclusions and Complex Arguments

Example: “Eric forgot to pay his gas bill again.

It looks like the poor guy is obsessed with finishing the novel he has been writing.
Anyway, he will be cold this winter.”

PREMISE: Eric forgot to pay his gas bill again

CONCLUSION 1: He is obsessed with finishing his novel

CONCLUSION 2: He will be cold this winter

Simple and Complex Arguments

Two types of conclusions in complex arguments:

- Intermediate - used as further premises
- Final - ultimate conclusion of an argument

Simple and Complex Arguments

Simple arguments have no
INTERMEDIATE CONCLUSIONS

- Consists of only ONE inference

Traditional Analysis

- Aristotle:
 - All propositions either assert or deny something of something else. *Subject* is the thing about which the assertion is made. *Predicate* is the thing asserted.
 - Any counterexamples?

Traditional Analysis

- How about “it is raining”? What is the subject?
- How about “there was a parade”?
- Aren’t these propositions? What is the subject?

Traditional Analysis

- TERMS in an argument, either a *class* of objects, or a set of *attributes* which determine the objects.
- Called: *Denotation/extension* and *connotation/intension*.
 - “philosopher” *extension* is “Socrates, Plato, etc.” and *intension* is “lover of wisdom,” “intelligent,” etc.

Some Questions to Ponder

- In what sense do the intension and extension of terms *belong* to the objects? Are they functions of nature? Mind? Of what?
- What assumptions do we make about objects and the use of terms in science?