PHI 103 - Introduction
Lecture 2

Overview of Logic

The Big Picture of the Discipline

Logic
an Overview

Definition: **Logic** (Gr. *logike*) - the ***systematic*** investigation of **argumentation** (or *rational thinking*).

I. **Three Basic Questions of Logic** -

A. ***What*** is an argument?

B. ***How*** do arguments work?

C. ***Why*** do arguments fail?

Logic
an Overview

II. **Two Types of Logical Systems** -

A. **INFORMAL LOGIC - *Induction*** - type/amount of evidence determines success

1. **Prediction** - inferring from past to future
2. **Analogy** - inferring from *known* similarities, to *un*known similarities
3. **Generalization** - inferring from a sample to a class
4. **Authority** - inferring from expertise to likely explanation
5. **Signification** - inferring from a sign to what the sign indicates
6. **Causation** - inferring from knowledge of causation to probable effects
7. ***Abduction*** - inferring to the most likely explanation

NOTE:

Inductive arguments yield conclusions that have a *degree of probability*.

less **more**

*n*00000000000.% 99.99999999999*n*%

B. **FORMAL LOGIC** - ***Deduction*** - structure/form determines success

1. **Syllogistic** Logic - relations of *terms* in categorical propositions
2. **Propositional** Logic - relations between ordinary *propositions*
3. **Predicate** Logic - functions of *quantifiers* (i.e., first-order, second-order calculus)
4. **Modal** Logic - functions of *modality* (i.e., necessary versus contingent)

NOTE:

Deductive arguments yield conclusions that are *logically necessary*.

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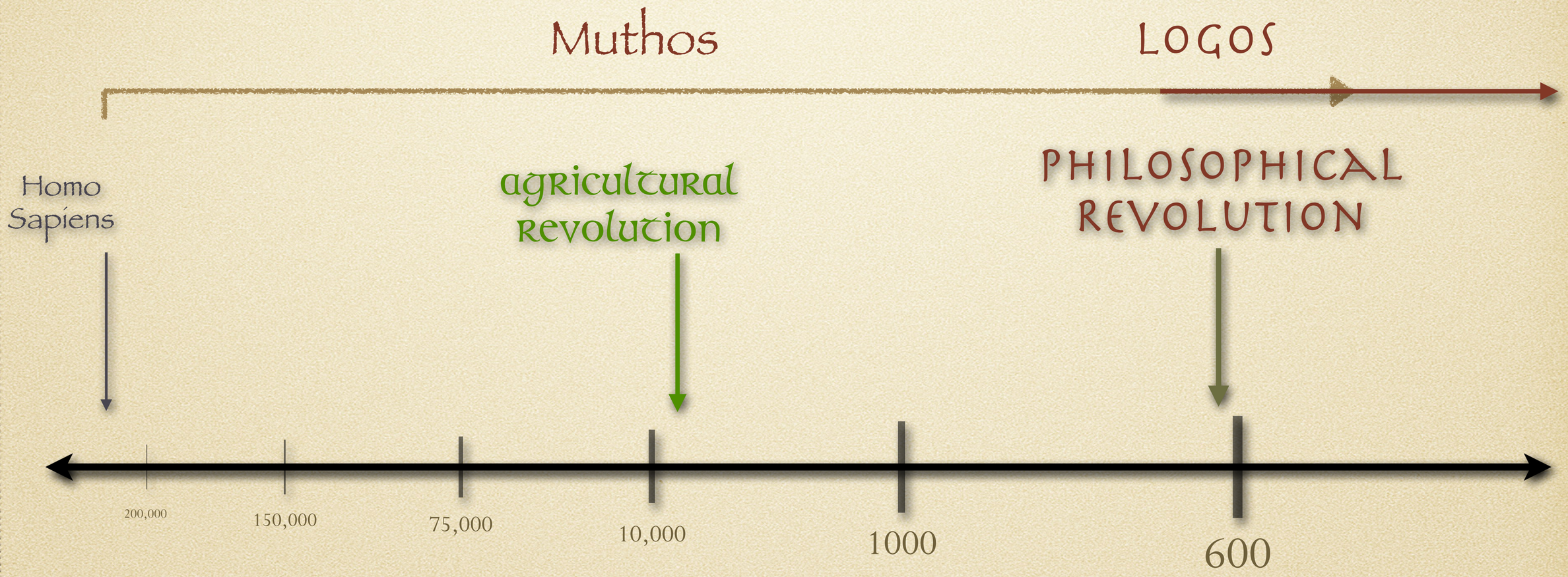
III. An Absurdly Brief History of Logic -



BCE - Before the Common Era

Logic
an Overview

III. An *Absurdly* Brief History of Logic -

A. **Pre-Aristotelian** - ***logos*** versus ***muthos***

1. Pythagorianism/Euclid - linear deduction
2. Xenophanes - (*c.* 570 - *c.* 475 BCE) *reductio ad absurdum*
3. Sokrates/Plato - *elenchos* and dialectic

B. **Aristotle** (384-322 BCE) - *Organon*

1. Induction/Deduction distinction
2. Formal and Informal Fallacies

C. **Stoicism** - Xrysippus (280-206 BCE) Propositional Logic

D. **Medieval Logic** -

1. Islamic
2. Scholasticism (*Peter Abelard*)

Logic
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E. **Modern Logic** -

1. **Enlightenment** - Logic as scientific instrument

   a. Francis Bacon (1561-1626) - *Novum Organum* ("experimentalism")
   b. Rene Descartes (1596-1650) - Methodological Skepticism
   c. Gottfried Leibniz (1646-1716) - **Algebraic Logic/Calculus**

2. **Nineteenth Century** -

   a. George Boole (1855-1864) - **Mathematical Logic** (*revision of Term Logic*)
   b. Gregor Cantor (1845-1918) - Set Theory, sizes of infinity
   c. Logicism/Predicate Logic - mathematics *as* logic (*Gottlob Frege, Bertrand Russell*)

3. **Twentieth Century** -

   a. Kurt Godel - **Incompleteness Theorem**
   b. Computational Programing - automated calculation/AI