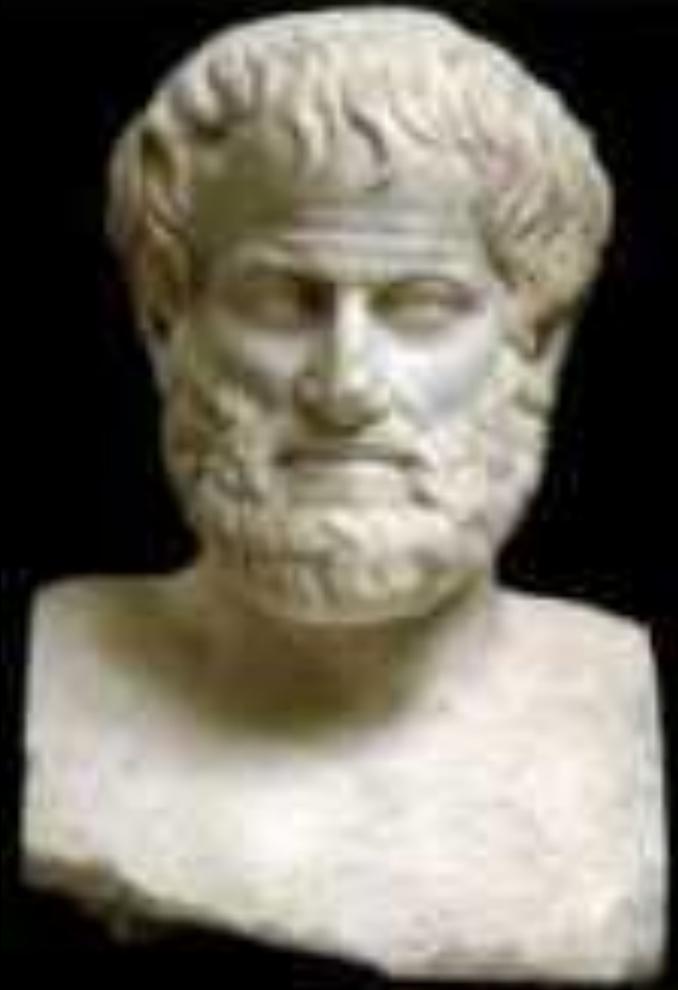


**Aristotle:  
the world's most  
influential thinker**



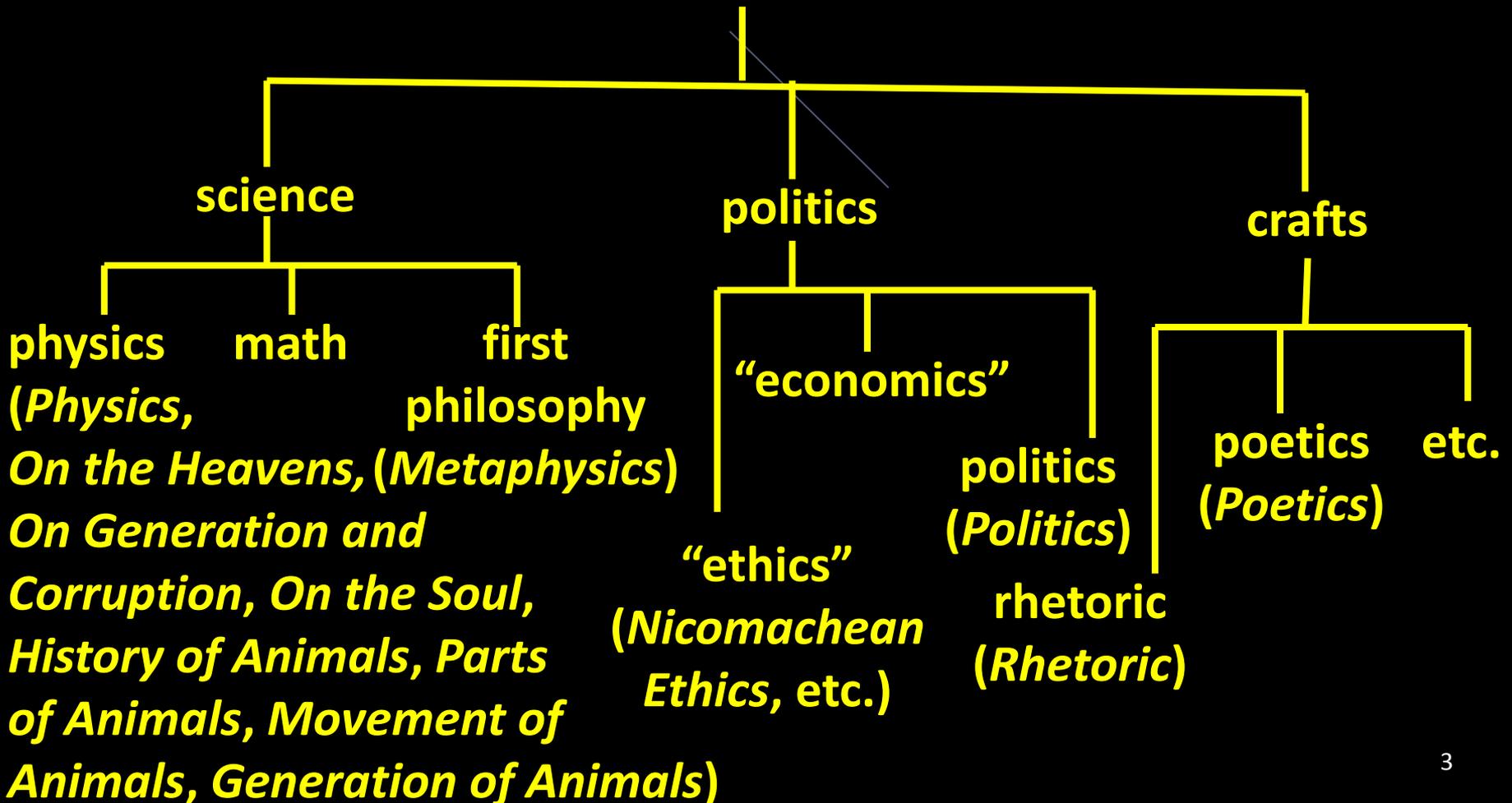
**D. L. Hitchcock**

**Third Age Learning, Burlington**

**2013 02 21**



**dialectic (*Topics, Sophistical Refutations*)**  
**analytics (*Prior Analytics, Posterior Analytics*)**  
**Categories, *On Interpretation***



# Abstract concepts from Aristotle

individual / universal

species / genus

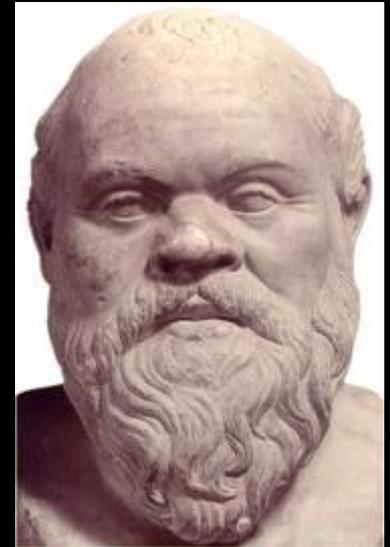
definition by genus & differentia

substance / attribute

essence / accident

matter / form

elements / compounds



# Aristotle's logic

- the first logician, and counted as one of the 5 greatest
- categorical syllogistic: a system
- 4 kinds of statements
  - A: universal affirmative (A belongs to\* every B)
  - E: universal negative (A belongs to\* no B)
  - I: particular affirmative (A belongs to\* some B)
  - O: particular negative (A does not belong to\* some B)
- \*or: is [not] predicated of
- 5 primitive rules (Barbara, Celarent, E conversion, I conversion, A conversion *per accidens*)
- direct deduction, indirect deduction
- proved (in 1973) to be *sound* and *complete*

# A proof in Aristotle's logic

“Let M be predicated of no N, but of every O. Since, then, the negative is convertible, N will belong to no M; but M was assumed to belong to every O; consequently N will belong to no O.” (*Prior Analytics* I.5.27a5-8)

1. M belongs to no N. (premise)
2. M belongs to every O. (prem)
3. N belongs to no M. (1, E conversion)
4. N belongs to no O. (3, 2, Celarent) □

e.g. M = winged, N = horse, O = bird

# The “method of contrasted instances”

How do you show that a form of argument is invalid?

Aristotle’s answer: Find an instance with true premises and a false conclusion.

“... if ... M belongs to no O, and not to some N, it is possible for N to belong either to every O or to no O. Terms for the positive relation are white, animal, raven; for the negative relation: white, stone, raven.” (*Prior Analytics* I.5.27b28-32)



# The concept of scientific proof

- proof = a deduction from true and primitive premises (directly or indirectly)

*Example:* Euclid's proof (*Elements IX.20*) that the prime numbers are more numerous than every given number of prime numbers.

A \_\_\_\_\_

B \_\_\_\_\_

C \_\_\_\_\_

A, B, C: the given prime #s

E \_\_\_\_\_ D\_F

ED: the least # divisible by A, B and C

DF: a unit added to ED

# proof that the Earth is spherical

“... in eclipses [of the moon—  
DH] the outline is always  
curved; and, since it is the  
interposition of the Earth  
that makes the eclipse, the  
form of this line will be  
caused by the form of the  
Earth’s surface, which is  
therefore spherical.” (*On the  
Heavens* II.14.297b27-30)





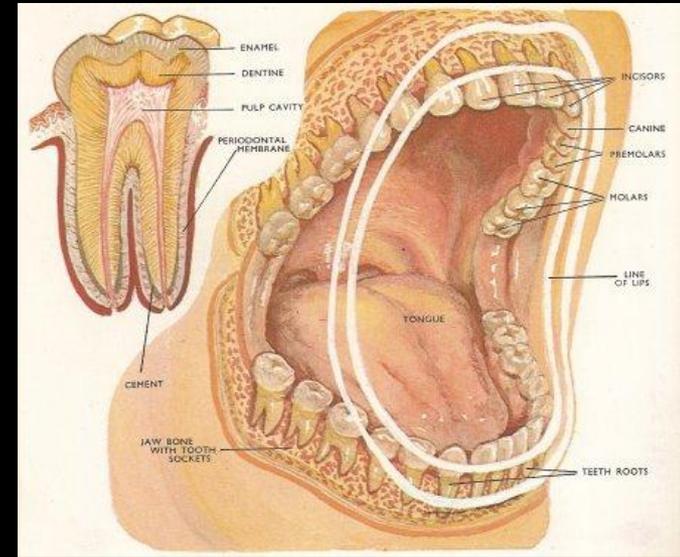
# Purpose in nature

4 causes: matter, form, mover, end  
nature: a cause that acts for the sake  
of something

why not by coincidence?

why not: “whenever ... the parts  
came about ... <as> if they had  
come to be for an end, such things  
survived, being organized  
spontaneously in a fitting way”  
(*Physics* II.8.198b29-31)?

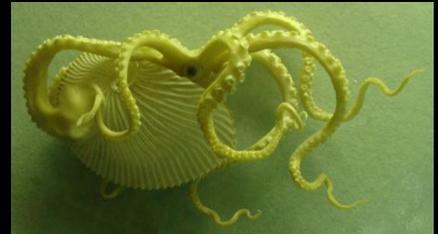
5 arguments against survival of the  
fittest as an explanation



“... the front teeth  
sharp, fitted for  
tearing, the molars  
broad and useful for  
grinding down the  
food” (*Physics*  
II.8.198b25-26)

# Aristotle's zoological writings

- about one-fifth of his surviving corpus
- Aristotle: the first zoologist
- “Linnaeus and Cuvier have been my two gods ... but they are mere school-boys to old Aristotle” (Charles Darwin, 1882)
- “a remarkable, well-balanced scientific knowledge of the diversity of the various invertebrate groups, very similar to that acquired by modern marine biologists in the same area of study” (Eleni Voultziadou and Dimitris Vafidis, *Marine invertebrate diversity in Aristotle's zoology, Contributions to Zoology*, 76 (2) 103-120 (2007))
- probably not from personal observation (Friedrich Solmsen, *The fishes of Lesbos and their alleged significance for the development of Aristotle, Hermes*, 106 (3) 467-484 (1978))



# Why study plants and animals?

“Having already treated of the celestial world, as far as our conjectures could reach, we proceed to treat of animals, without omitting, to the best of our ability, any member of the kingdom, however ignoble. For if some have no graces to charm the senses, yet nature, which fashioned them, gives amazing pleasure in their study to all who can trace links of causation, and are inclined to philosophy... Every realm of nature is marvellous... we should venture on the study of every kind of animal without distaste; for each and all will reveal to us something natural and something beautiful. Absence of haphazard and conduciveness of everything to an end are to be found in nature’s works in the highest degree, and the end for which those works are put together and produced is a form of the beautiful.” (*Parts of Animals* I.5.645a4-25)

# Purposes of organs

*eyebrows*: to shelter the eyes from fluids trickling down from the head

*lips*: in all animals except man to preserve and guard the teeth

*lung*: the organ of respiration (*not* to meet the jumping of the heart)

*analogous organs*: e.g. what in the bird is feather, in the fish is scale

“... the roots of plants are analogous to the mouth of animals, both serving for the absorption of food.” (*On the Soul* II.1.412b2-3)



# The god of the philosophers

“... the most natural act <for a plant or animal> is the production of another like itself, an animal producing an animal, a plant a plant, in order that, as far as its nature allows, it may partake in the eternal and the divine.” (*On the Soul* II.3.415a26-b1)

- God: the first unmoved mover
- thought thinking itself
- an eternal living being, in a better state than the good state (of contemplation) in which we sometimes are
- without magnitude, without parts, indivisible
- causes motion as an object of thought and desire

# The ultimate goal of human life

- its name: *eudaimonia* (roughly, happiness)= doing well = living well
- its content: exercise of specifically human excellences over a complete lifetime
- excellences of intellect: wisdom, prudence
- excellences of character: e.g. temperance, courage, good temper, generosity, proper pride, truthfulness, friendliness

# Excellence of character as a mean: some examples

sphere	vice of excess	excellence/ virtue	vice of deficiency
feeling of fear	cowardice	courage	[no name]
pleasures of touch and taste	intemperance	temperance	“insensibility”
giving and taking money	wastefulness	generosity	stinginess
small honours	ambition	[no name]	lack of ambition
anger	irascibility	good temper	inirascibility
giving pleasure in daily life	ingratiatingness, flattery	friendliness	quarrelsomeness



# forms of government (constitutions)



- preliminary work: constitutional histories of 156 city-states

rule by	for the common interest	for the private interest of the rulers
one	monarchy (of best person)	tyranny
few	aristocracy (of merit)	oligarchy (few rich who are noble)
many	constitutional government	democracy (many poor who are free)

- the best form of government for most states: the middle constitution, with the political community formed by citizens of the middle class (neither rich nor poor)
- a primary cause of stability: the spirit of obedience to law
- citizens who are roughly equal in their ability to rule should take their turn at governing and being governed



## Rhetoric: the art of observing the available means of persuasion through speech

- 3 means: the speaker's character, the hearers' emotions, proof by persuasive arguments
- rhetorical argument: quasi-deduction from probabilities and signs, example
- 3 types: forensic, deliberative, epideictic

# Poetics

“A tragedy, then, is the imitation of an action that is serious and ... complete in itself; ... in a dramatic, not a narrative form; with incidents arousing pity and fear, wherewith to accomplish its catharsis of such emotions.”  
(*Poetics* 1449b24-28)

*Thank you for your attention.*

