



**THE NATURE OF NATURE IN
ANCIENT AND MEDIEVAL WORLDS
STS.003, FALL 2010**

Matter unit

Overarching question:

Is the stuff of the world unchanging or transmutable?
How have the institutions of science evolved?

I. Particles, Waves, and Cats

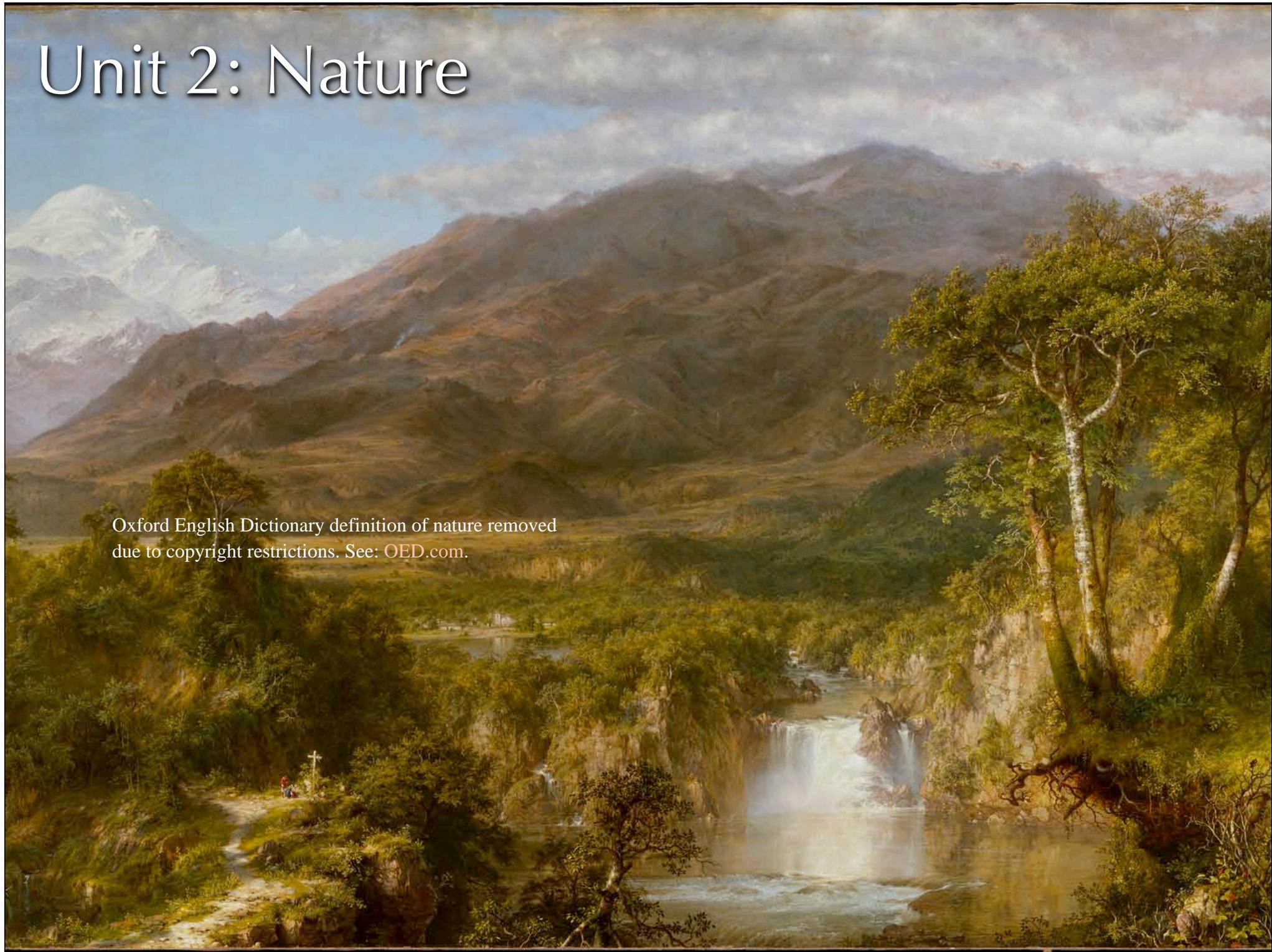
II. Nuclear Transmutation

III. Open Questions

Readings: Smyth, *Atomic Energy for Military Purposes*, 206-226;
Dear, *Intelligibility of Nature*, 141-172.

Unit 2: Nature

Oxford English Dictionary definition of nature removed
due to copyright restrictions. See: [OED.com](https://www.oed.com).



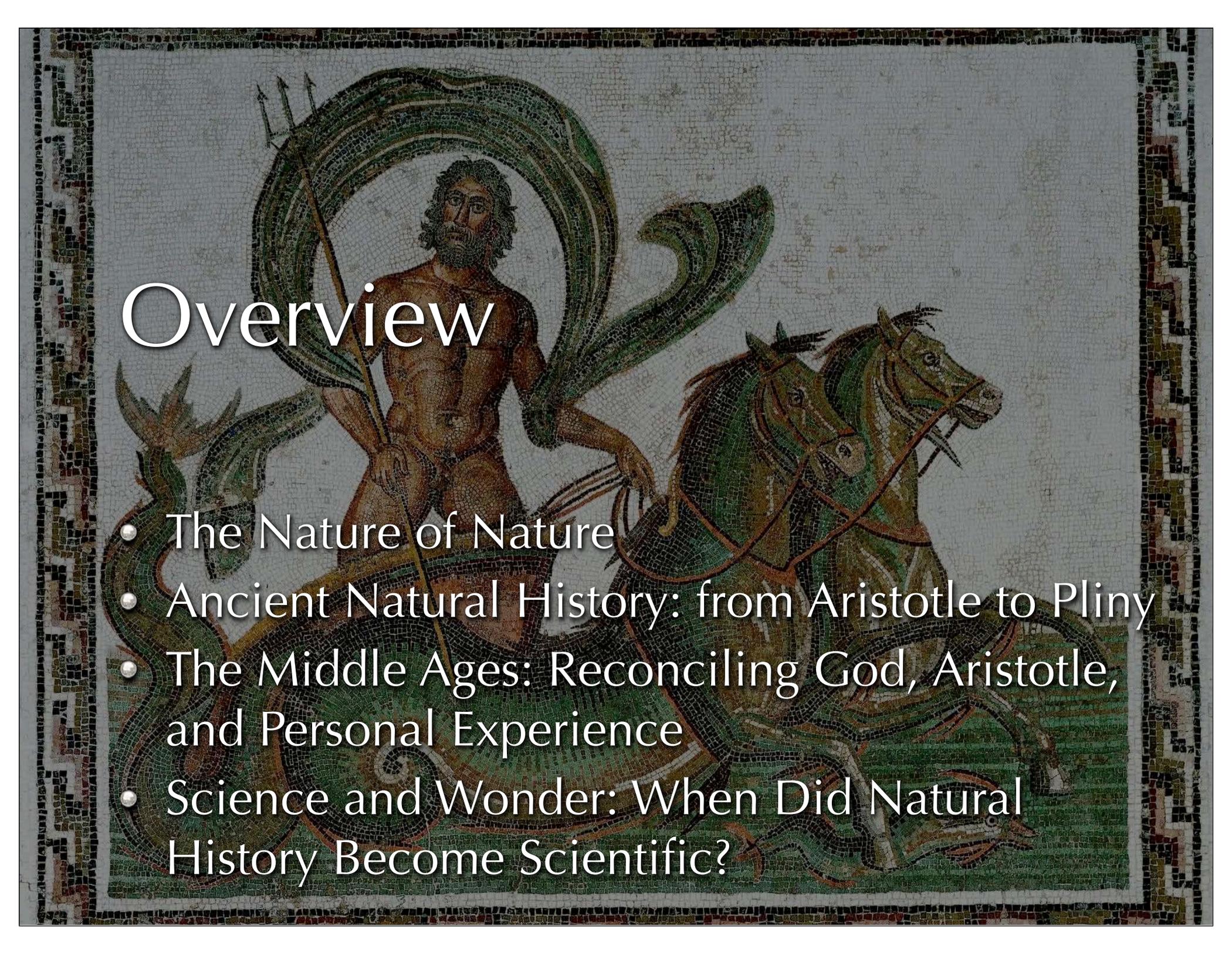
Unit 2: Nature

A detailed landscape painting showing a vast mountain range under a cloudy sky. In the foreground, a river flows through a lush, green valley, with a large, leafy tree on the right bank. The mountains in the background are layered, with some peaks covered in snow or light-colored rock. The overall scene is a harmonious blend of natural elements.

(1a) Are humans part of nature? Are they distinct from nature? Do they make nature?

(1b) Are living things, in particular species, changing or unchanging?

(2) Science and commerce



Overview

- The Nature of Nature
- Ancient Natural History: from Aristotle to Pliny
- The Middle Ages: Reconciling God, Aristotle, and Personal Experience
- Science and Wonder: When Did Natural History Become Scientific?

Nature: Presence and Permeability



Photo courtesy of [MarkyBon](#) on Flickr.



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Nature: Subsistence and Knowledge





Science?

Supernatural Nature?





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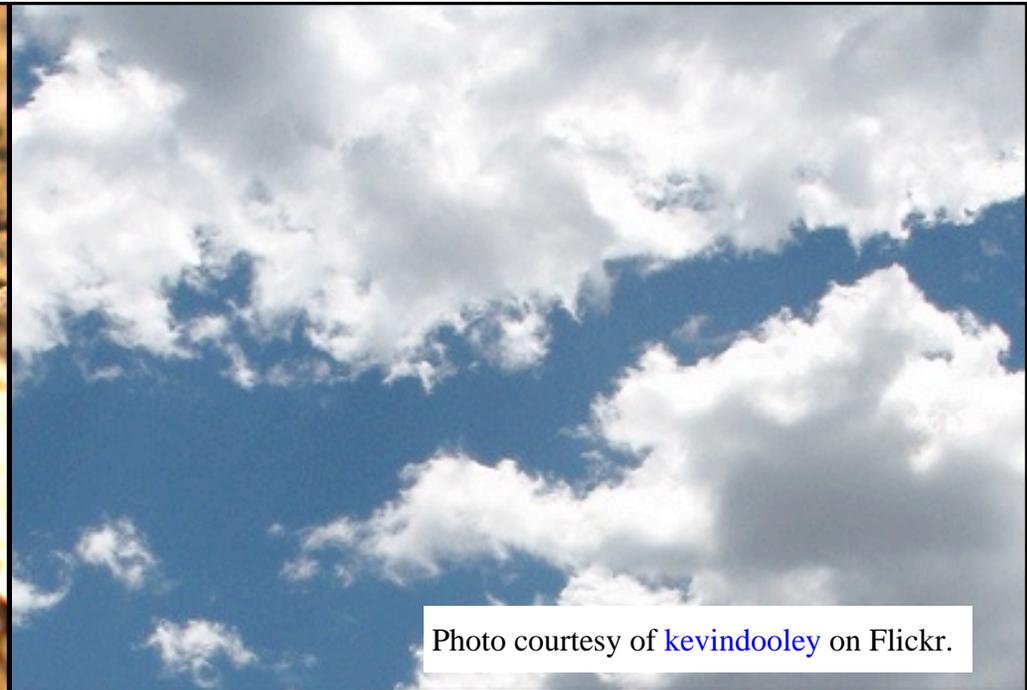


Photo courtesy of [kevindooley](#) on Flickr.

What Is the Matter of Nature?



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Aristotle:

Matter vs. Form



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Actual vs. Potential

PHOTO OF A CHAMBERED
NAUTILUS REMOVED DUE TO
COPYRIGHT RESTRICTIONS.

IMAGE OF "HISTORY OF ANIMALS, BOOKS I-III," ARISTOTLE,
REMOVED DUE TO COPYRIGHT RESTRICTIONS.

PHOTO OF AN OCTOPUS
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The Soul

- Nutritive: plants
- Sensitive: animals
- Rational: humans

- Mortal or immortal?



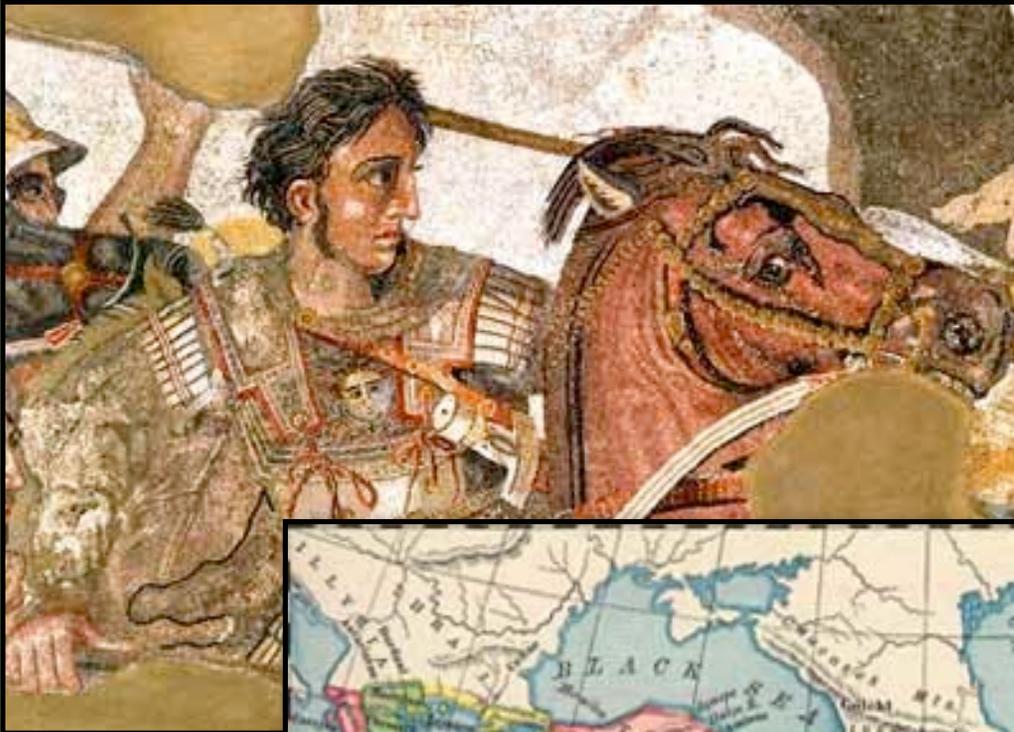
Do species change?

IMAGE OF "THE FIRST FOSSIL
HUNTERS PALEONTOLOGY IN
GREEK AND ROMAN TIMES,"
ADRIENNE MAYOR, REMOVED
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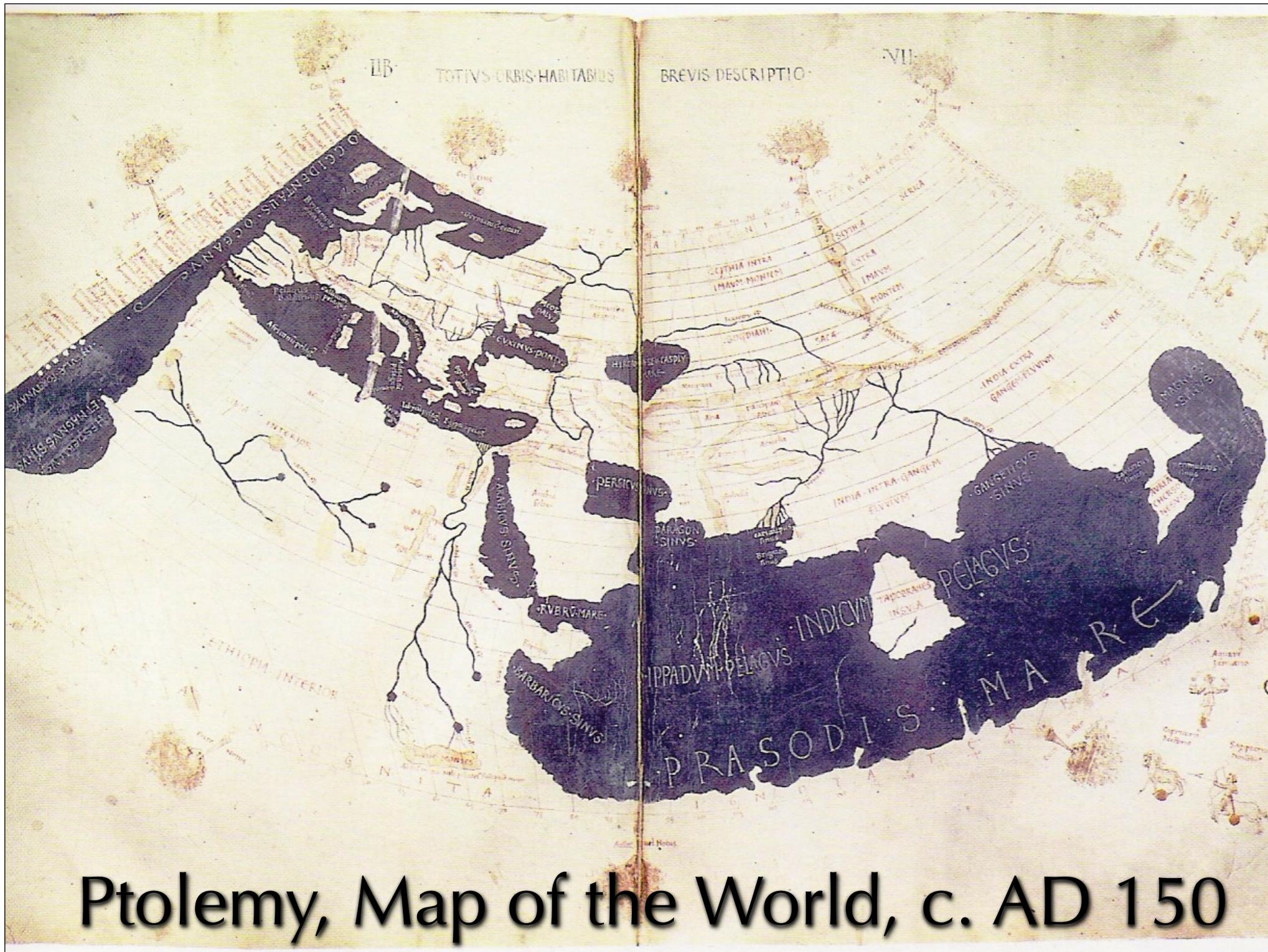


Photo courtesy of [IslesPunkFan](#) on Flickr.

Cyclops?



Empire, Commerce, and Knowledge



Ptolemy, Map of the World, c. AD 150

C. PLINII
SECUNDI NATURALIS
HISTORIAE LIBER
SECUNDVS.

1



An sit mundus, & an vnus.

CAP. I.



VNDVM † & hoc, quod nomine alio cælum appellare libuit, cuius circumflexu teguntur cuncta, numen esse credi par est, æternum, immensum, neq; genitum, neq; interitum vnquam. Huius exterâ indagare, nec interest hominum, nec capit humanæ coniectura mentis. Sacer est, æternus, immensus, totus in toto, imò verò ipse totum: finitus, & infinito similis; omnium rerum certus, & similis incerto: extrâ, intrâ, cuncta complexus in se, idemq; rerum naturæ opus, & rerû ipsâ natura. Furor est, mensuram eius animo quosdam agitalle, atq; prodere ausos: alios rursus occasione hinc sumpta, aut his data, innumerabiles tradidisse mûdos, vt totidem rerû naturas credi oporteret; aut, si vna omnes incubaret, totidem tamen Soles, totidemque Lunas, & cætera etiam in vno & immensa, & innumerabilia sidera: quasi non eadem quæstione semper in termino cogitationis occursura, desiderio finis alicuius; aut, si hæc infinitas naturæ omnium artifici possit assignari, non illud idem in vno faciliùs sit intelligi, tanto præsertim opere. Furor est, profectò furor, e credi ex eo; & tanquam interna eius cuncta planè iam sint nota, ita scrutari exterâ: quasi verò mensuram vllius rei possit agere, qui sui nesciat; aut mens hominis videre, quæ mundus ipse non capiât.

† Aliâ sic, & hoc, quodcumque cuius appellare libuit.

De forma eius.

CAP. II.

Formam eius in speciem orbis absoluti globatam esse, nomen in primis & consensum in eo mortalium, orbem appellantium, sed & argumenta rerum docent: non solum quia talis figura omnibus sui partibus vergit in sese, ac sibi ipsâ toleranda est, seque includit & continet, nullarû egens compaginum, nec finem aut initium vllis sui partibus sentiens, nec quia ad motum, † quo subinde verti debeat (vt mox apparebit) talis aptissima est: sed oculorum quoque probatione, quòd conuexus mediusque quacunque cernatur, quum id accidere in alia non possit figura.

† quò subinde verti debeat.

De motu eius.

CAP. III.

Hanc ergo formam eius, æterno & irrequieto ambitu inenarrabili celeritate, viginti quatuor horarum spatio circumagi, Solis exortus & occasus haud dubiù reliquere. An sit immensus, & ideo sensum aurium faciliè excedens, tantæ molis rotatæ vertigine assidua sonitus, non equidem faciliè dixerim, non hercle magis, quàm circumactorum simul tinnitus siderum, suosque voluentium orbis: an dulci quidem & incredibili suauitate contentus, nobis qui intus agimus, iuxta diebus noctibusq; tacitus labitur mundus. Esse innumeras ei effigies animalium rerumq; cunctarum impressas, nec (vt in volucrum notamus ouis) læuitate continua lubricum corpus, quod clarissimi

A auctores

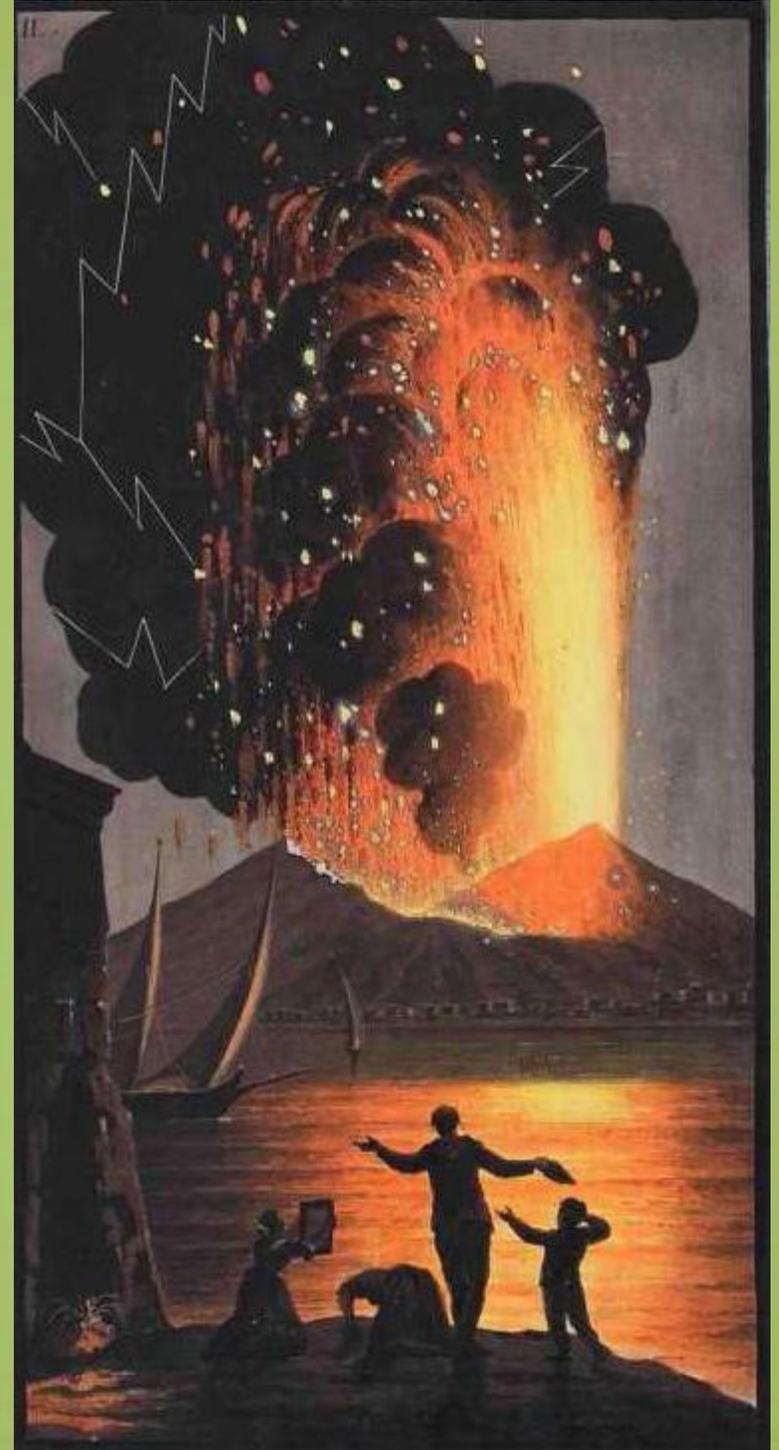
Pliny the Elder Natural History c. AD 70

- Reviewed 2000 books
- 20,000 facts
- Marvels and mundane

Pliny the Younger
"Letter to Cornelius Tacitus,"
c. AD 79

Key Points:

- Curiosity and description
- Catalogue facts
- Theorizing
- Networks of trade and information
- Ambivalent about nature-human question



Dioscorides, De Materia Medica

ΠΕΔΑΚΙΟΥ

ΔΙΟΣΚΟΡΙΔΟΥ ΑΝΑΞΑΡΒΕΩΣ

ΠΕΡΙ ΥΓΙΗΣ ΙΑΤΡΙΚΗΣ

ΒΙΒΛΙΟΝ ΠΡΩΤΟΝ.



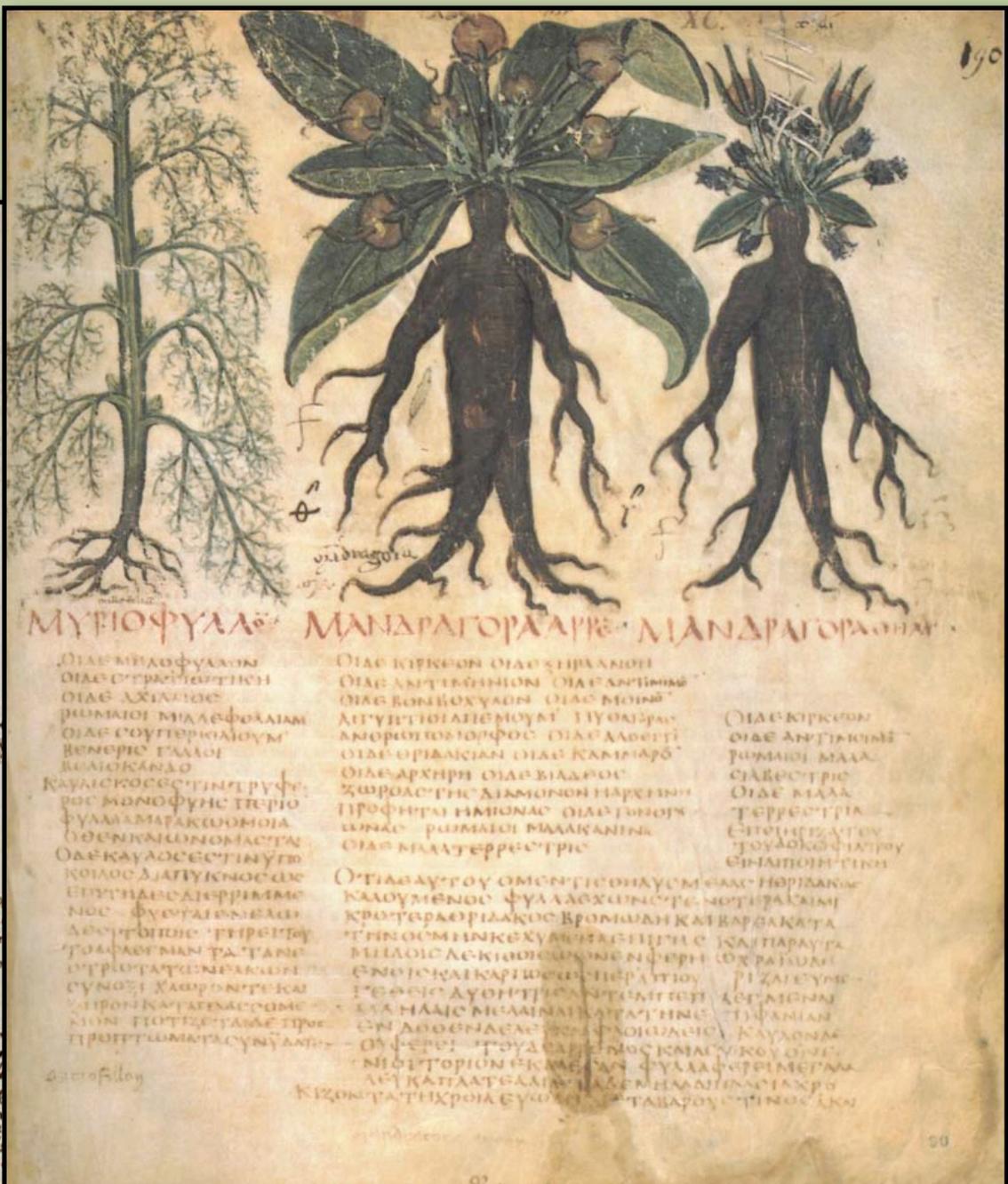
ΟΛΛΩΝ οὐ μόνον ἀρχαίωμ, ἀλλὰ καὶ νέωμ
σαυταξαμλίωμ πρὶ τῶ φαρμάκωμ σκόνια
σίας τε καὶ δυνάμειω, καὶ δοκιμασίας εὐλο-
τατε ἀρει, παρὰ σομά σοι πρᾶσθαι μὴ
κενήμ, μὴ δὲ ἄλογω ὀρημῆ ἐχκίνααι πρὸς
τιώδε πλὴν πραγματείαμ. διὰ δὲ τούτῳ αὐ-
τῶμ, μὴ πετρωκίνααι, τούτῳ ἡ ἰσορίας τὰ πλεῖστα ἀναγράφαι.

Iolag le gebat
Eriph
ing Corn
Iola lea
Maib.
Cor.

Ιόλας μὲν γὰρ ὁ βιβλωὺς καὶ ἠρακλείδης ὁ ταραντίνος, ἐπὶ ὀλί-
γομ ἠφᾶντο τῶ αὐτῆς πραγματείας. πλὴν βοτανικῆμ παντὸς ἑα-
σάντες πρᾶσθαι. οὐ μὲν οὐδὲ τῶν μεταλλικῶν, ἀλλὰ μόνον τῶν
πρὸς ἐμμενικῶν ὄντων. κρατείας δὲ ὁ εἰζοτόμος, καὶ ἀνδρείας ὁ
ἰατρός, οὗτοι γὰρ δοκῶσι ἀκριβέστερον ἢ ἄλλοι πρὶ τούτῳ δὲ
μέγῃ ἀναγράφαι, πλὴν ἕξασιν ἐν ἐκδοτάτῳ, καὶ ἕνας βο-
τάνας ἀπρᾶσθαι μὲν εἰς αὐτῶν. πλὴν τοῖς μὲν ἀρχαίοις μαρτυ-
ρητέον μετὰ ὀλιγότῳ ἢ πρᾶσθαι, καὶ πλὴν ἀκριβέσταμ
προσπράλαθοῦσι. τῶ μὲν τοῖς νέοις οὐ συγκαταθετέον, ὡς ὅτι
βάσος ὁ πυλαῖος, καὶ Νικίρατος, καὶ Περσῶν, καὶ Νίγρης, καὶ Διό-
δοτος, ἀσκληπιάδαι πάντες, οἱ πλὴν μὲν πᾶσι σύμφυλλομ καὶ
γνώριμομ ἕλλη, καὶ ἰσὶ αὐτῶν ἐπὶ πρᾶσθαι ἀναγράφαι ἀκριβέστα, τὰς δὲ
ἢ φαρμάκωμ δυνάμειω καὶ δοκιμασίας ἡ ἐπιδρῶμεις πρὸς
δοκῶμ. οὐ τῆ πᾶσι πλὴν ἐπιγράφαι αὐτῶμ κενονίζοντες, τῆ δὲ τῶ
αὐτῶν κενονίζοντες, εἰς ἀσκομ διαφορὰς ἐκαστῶν αὐτῶν ἀναφίρον-
τες μετὰ τῶ καὶ ἄλλῳ ἀντὶ ἄλλωμ ἀναγράφαι. ὁ γὰρ ἀπὸ ἀπρᾶ-
σθαι δοκῶμ εἶναι ἐν αὐτῶν Νίγρης, δὲ ἐφορῶν φκίμ ὁ δὲ εἶναι
χαμειάας, γηνωμλίνας ἐν ἰταλίῳ. καὶ δὲ ἀνδρῶσταιμομ, ταυτῶμ
ὑπάρχειμ ὑπὸ τῶ ἄλλῳ ἢ ὀρηκτῆμ ἐν ἰσθμῶν γηνωμλίνας. καὶ ἄλλῳ
τῶ τοῖς ὅμοια πλεῖστα πρὸ πλὴν ἀλήθειαν ἐκίθηται ψευδῶ. ἀπὸ
ὅτι πικμῆρια οὐκ αὐτοφύτας, ἀλλὰ τῶ ἐκ πρᾶσθαι σμάτωμ ἰσορίας.

*Eriphania in P
i. i. promigio
sup tepoia co
nyes, n. Cor*

** Aug. Gebalt
zwei Antiqu
nyes, nach die
Cis drant dia
cor. C. Maib
libris in quibus
antiquitas val
mel. C. i. quos
Fah. med. Cam
Causat in humo
ndans schiff.*



Loss and Preservation

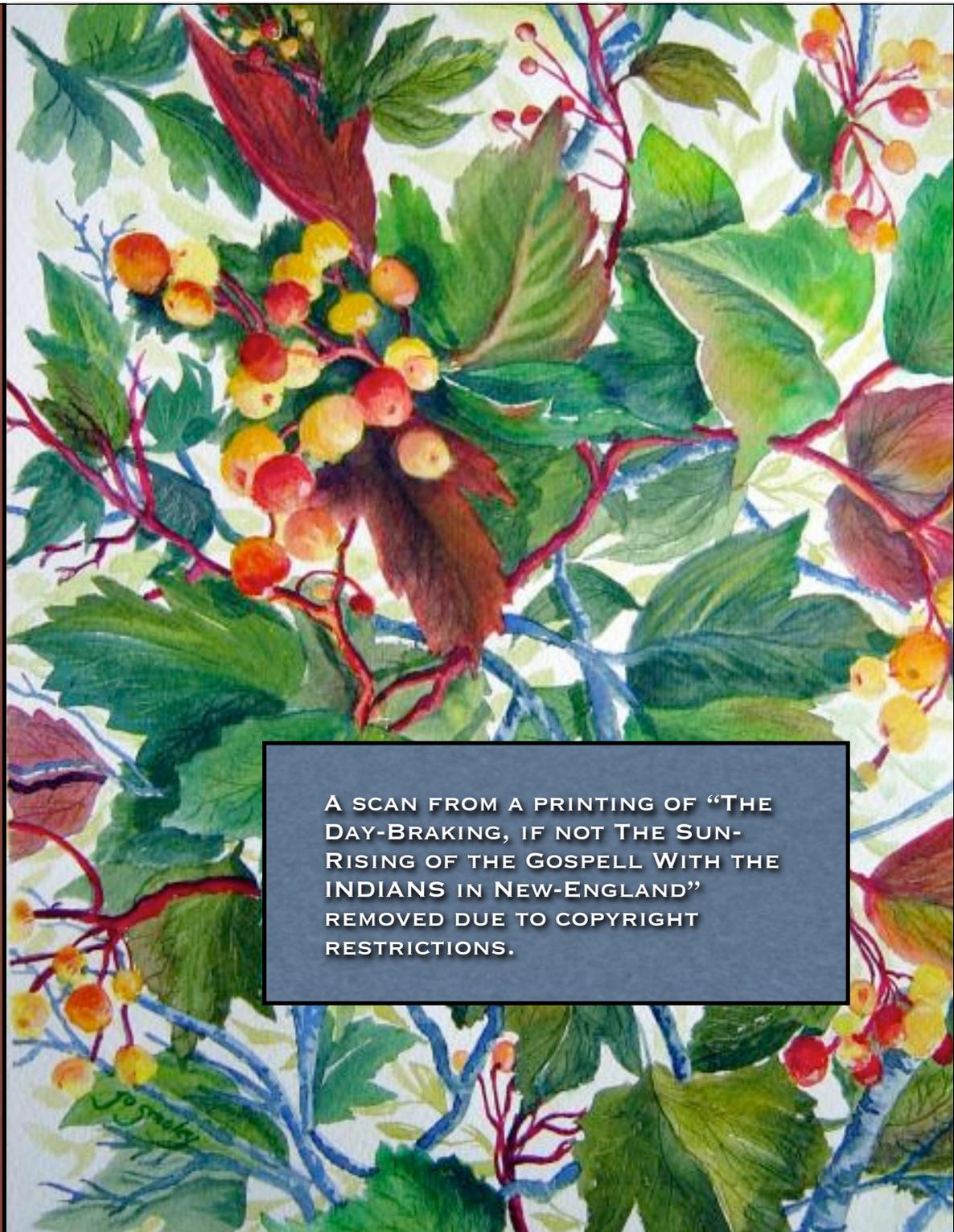
Europe, c. 1000

MAP OF EUROPE CA. 1000
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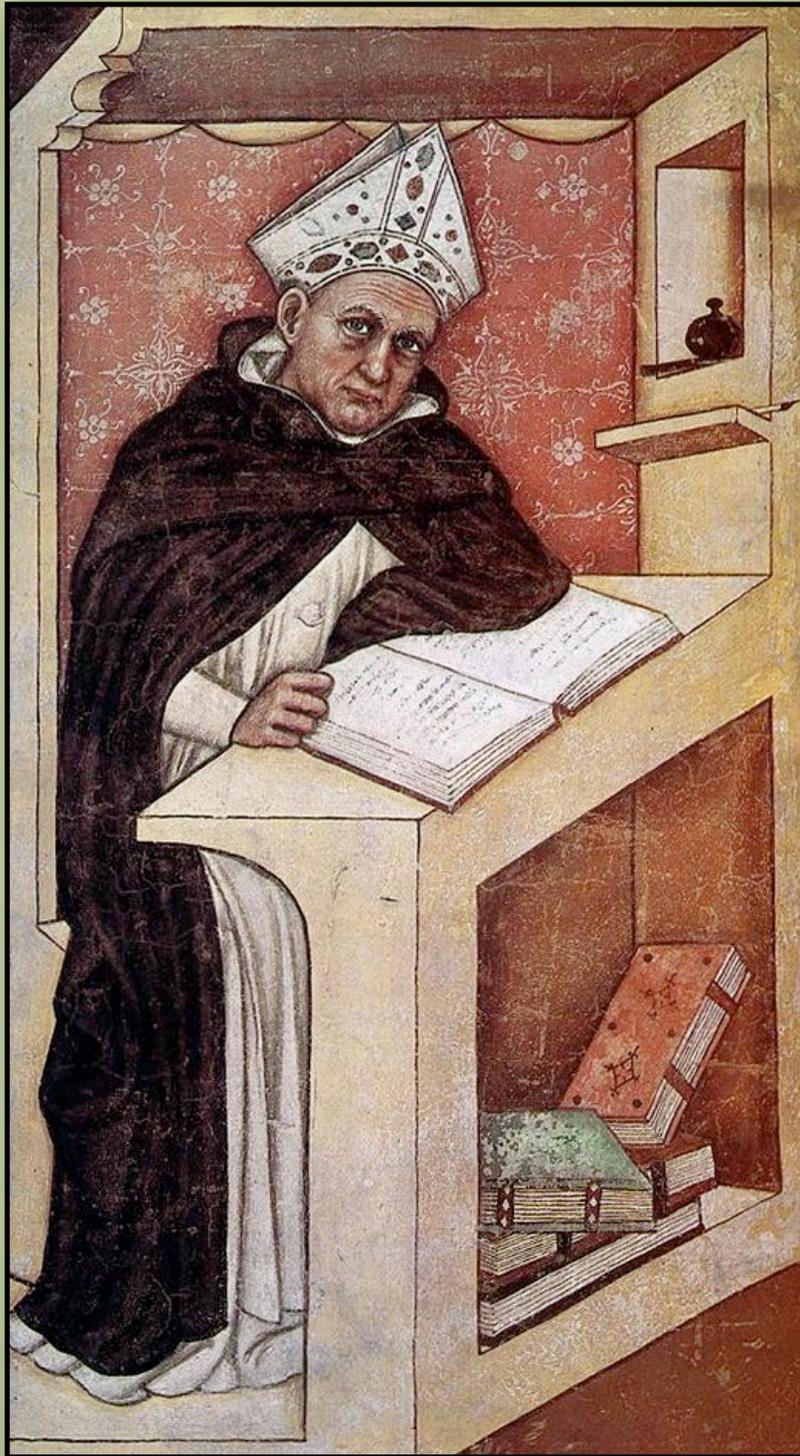
IMAGE OF "THE DAY-BRAKING,
IF NOT THE SUN-RISING OF
THE GOSPELL WITH THE
INDIANS IN NEW-ENGLAND"
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John Eliot, 1647



A SCAN FROM A PRINTING OF "THE
DAY-BRAKING, IF NOT THE SUN-
RISING OF THE GOSPELL WITH THE
INDIANS IN NEW-ENGLAND"
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Albert the Great (c. 1193-1280)

- Educated in Padua, Cologne, Paris
- Extensive commentaries on Aristotle -- 8000 modern pages
- *On Animals* -- 1800 pages -- adds his own zoological descriptions and theories

Frederick II, “stupor mundi”



MAP OF EUROPE CA. 1200
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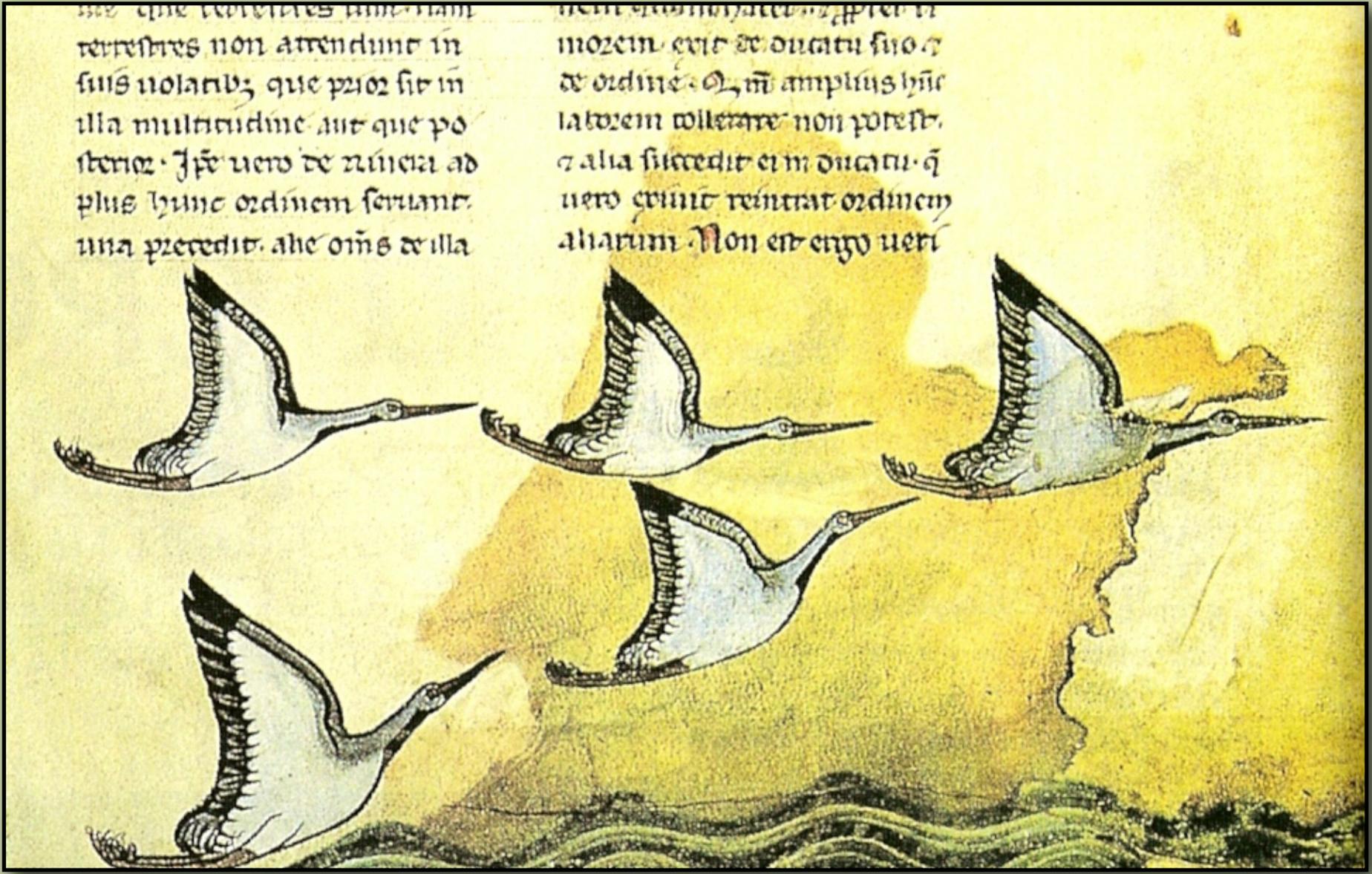
Falconry: translating across time and place



- Frederick II:
- Extensive contact with Islamic leaders and scholars
- Michael Scottus, at his court, translates Aristotle's *History of Animals* from Arabic "Kitāb al-Hayawān" -- he may actually have poached from Jewish scholars and Hebrew sources
- Master Theodore of Antioch, at his court, translates treatise of an Arab falconer, Moamyn
- Frederick amended and republishes Aristotle's work
- Wrote his own book on falconry

que terrestres sunt. Nam
terrestres non attendunt in
suis uolatibus; que prior sit in
illa multitudine aut que po-
sterior. Ipe uero de rancia ad
plus hunc ordinem seruant.
una precedit. alie omnes de illa

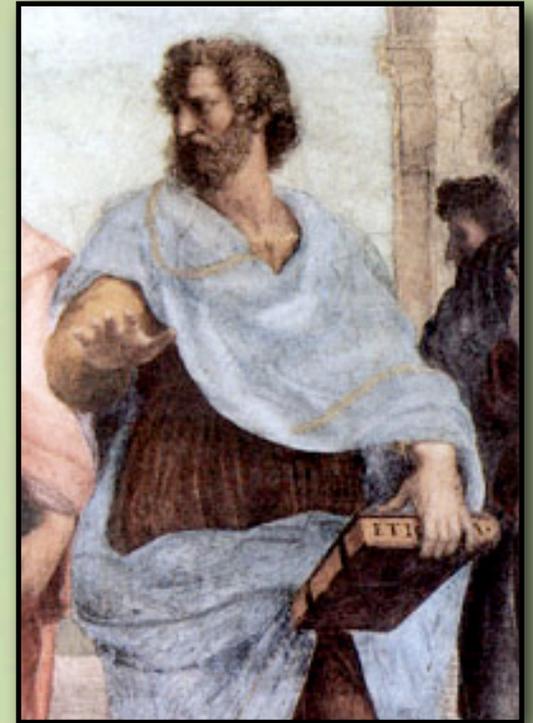
ueniunt. Quia si prior sit in
morem. erit de ducatu suo. et
de ordine. Quia amplius hunc
latorem colligere non potest.
et alia succedit ei in ducatu. quod
uero erunt reuertat ordinem
aliarum. Non est ergo ueri



The Art of Falconry: Theory and Practice



Frederick II on Aristotle: Respect and Skepticism



“We discovered by hard-won experience that the deductions of Aristotle, whom we followed when they appealed to our reason, were not entirely to be relied upon, more particularly in his descriptions of the characters of certain bird.”



Medieval Bestiaries: Mythology, Symbolism



New-Englands
RARITIES
Discovered:

IN
Birds, Beasts, Fishes, Serpents,
and *Plants* of that Country.

Together with
The *Physical* and *Chyrurgical* REMEDIES
wherewith the *Natives* constantly use to
Cure their DISTEMPERS, WOUNDS,
and SORES.

ALSO
A perfect Description of an *Indian SQUA*,
in all her Bravery; with a POEM not
improperly conferr'd upon her.

LASTLY
A CHRONOLOGICAL TABLE
of the most remarkable Passages in that
Country amongst the ENGLISH.

Illustrated with CUTS.

By JOHN JOSSELYN, Gent.

London, Printed for G. Widdowes at the
Green Dragon in St. Pauls Church-yard, 1672.

First, Of Birds.

The Humming Bird.

THe *Humming Bird*, the least of all
Birds, little bigger than a *Dor*, of va-
riable glittering Colours, they feed upon
Honey, which they suck out of Blossoms

and Flowers with their long Needle-like
Bills; they sleep all Winter, and are not to
be seen till the Spring, at which time they
breed in little Nests made up like a bottom
of soft Silk-like matter, their Eggs no
bigger than a white Pease, they hatch three
or four at a time, and are proper to this
Country.

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For Aches and Cold Swellings.

Their Grease is very good for Aches
and Cold Swellings, the *Indians* anoint
themselves therewith from top to toe,
which hardens them against the cold
weather. A black Bears Skin heretofore
was worth forty Shillings, now you may
have one for ten, much used by the *English*
for Beds and Coverlets, and by the *In-*
dians for Coats.

For pain and lameness upon Cold.

One *Edw. Andrews* being foxt, and fal-
ling backward cross a Thought in a Shal-
lop or Fisher-boat, and taking cold upon
it, grew crooked, lame, and full of pain,
was cured, lying one Winter upon Bears
Skins newly flead off, with some upon
him, so that he sweat every night.

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The Beaver, Canis Ponticus, Amphybious.

The *Beaver*, whose old ones are as big
as an *Otter*, or rather bigger, a Creature
of a rare instinct, as may apparently be
seen in their artificial Dam-heads to raise
the water in the Ponds where they keep,
and their houses having three stories, which
would be too large to discourse: They
have all of them four Cods hanging out-
wardly between their hinder legs, two of
them are soft or oyley, and two solid or
hard; the *Indians* say they are *Herma-
phrodites*.

For Wind in the Stomach.

Their solid Cods are much used in Phy-
sick: Our *Englishwomen* in this Country
use the powder grated, as much as will lye
upon a shilling in a draught of *Fiol Wine*,
for Wind in the Stomach and Belly, and
venture many times in such cases to give
it to Women with Child: Their Tails are
flat, and covered with Scales without hair,
which

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The Rattle Snake.

The *Rattle Snake*, who poysons with
a Vapour that comes thorough two croo-
ked Fangs in their Mouth; the hollow of
these Fangs are as black as Ink: The *In-*
dians, when weary with travelling, will

take them up with their bare hands, laying
hold with one hand behind their Head, with
the other taking hold of their Tail, and
with their teeth tear off the Skin of their
Backs, and feed upon them alive; which
they say refresheth them.

For frozen Limbs, Aches, and Bruises.

They have Leafs of Fat in their Bellies,
which is excellent to annoint frozen Limbs,
and for Aches and Bruises wondrous sove-
raign. Their Hearts swallowed fresh is a
good Antidote against their Venome, and
their Liver (the Gall taken out) bruised
and applied to their Bitings is a present
Remedy.

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The Turkie.

The *Turkie*, who is blacker than ours; I have heard several credible persons affirm, they have seen *Turkie Cocks* that have weighed forty, yea sixty pound; but out of my personal experimental knowledge I can assure you, that I have eaten my share of a *Turkie Cock*, that when he was pull'd and garbidg'd, weighed thirty pound;

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Thirdly, Of Fishes.

Pliny and *Isadore* write there are not
above 144 Kinds of Fishes, but to
my knowledge there are nearer 300: I
suppose *America* was not known to *Pliny*
and *Isadore*.

A Catalogue of Fish, that is, of those that
are to be seen between the English Coast
and America, and those proper to the
Countrey.

Alderling.

Alize, Alewife, because great bellied;
Olasle, Oldwife, Allow.

Anchova or Sea Minnow.

Aleport.

Albicore.

Barble.

Barracha.

Barracoutha, a Fish peculiar to the West-
Indies.

Barsticle.

Basse.

Sea Bitter proper to the Norman Seas.

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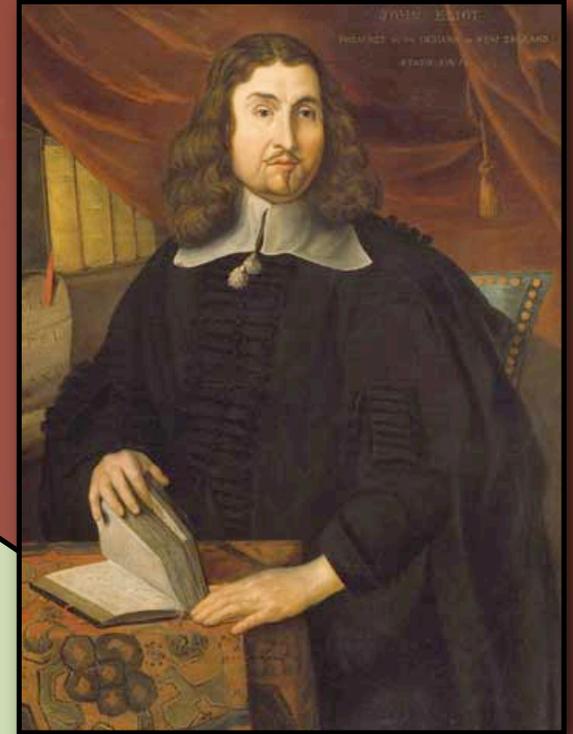
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I shall conclude this Section with a
strange Cure effected upon a Drummers
Wife, much afflicted with a Wolf in
her Breast; the poor Woman lived with
her Husband at a Town called by the
Indians, Casco, but by the *English,*
Famouth; where for some time she swa-
ged the Pain of her Sore, by bathing it
with strong Malt Beer, which it would

suck in greedily, as if some living Crea-
ture: When she could come by no more
Beer, (for it was brought from *Boston*, a-
long the Coasts by Merchants,) she made
use of *Rhum*, a strong Water drawn
from Sugar Canes, with which it was
lull'd a sleep; at last, (to be rid of it al-
together) she put a quantity of *Arsnick*
to the *Rhum*, and bathing of it as former-
ly, she utterly destroyed it, and Cured
her self; but her kind Husband, who
sucked out the Poyson as the Sore was
healing, lost all his Teeth, but without
further danger or inconvenience.



Key Points:

- Curiosity about the natural world
- Great skill with description and theorizing
- Natural world still infused with myth and meaning

The Birth of Science?

- 16th century Dutch traders: Brazil, Africa, India, Spice Islands, Japan
- New products of commercial and medicinal value
- Needed consensus about description and classification
- Cook's Claim: This fueled the emergence of an objective, materialist, fact-based (modern) natural history

IMAGE OF "MATTERS OF EXCHANGE
COMMERCE, MEDICINE, AND SCIENCE IN THE
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