THE PREDICTION PROJECT

Alyssa A. Goodman

Harvard-Smithsonian Center for Astrophysics & Radcliffe Insitute for Advanced Study

@aagie, @PredictionX

PREDICTIONX

on edX

created by HarvardX

KARLOS
LIBERO

T-Mobile...
4:16 PM
97%
Via dei Fori Imperiali, 1
Colosseum
4 min
5 min
6 min
Hotel Duca D'Alb
Via Giovann
4 min
Basilica di San Pietro in Vincoli
Domus Aurea
Parco Del Colle Oppio
6 min
Arco di Costantino
Ristorante Pizz
4 min (1.1 km)
Fastest route, despite the usual traffic

T-Mobile... 4:16 PM 97%
Via dei Fori Imperiali, 1
Colosseum
4 min
5 min
6 min
Hotel Duca D'Alb
Cavour
Via Giovanni
4 min
Basilica di San Pietro in Vincoli
Domus Aurea
Parco Del Colle Oppio
6 min
Arco di Costantino
Ristorante Pizz
4 min (1.1 km)
Fastest route, despite the usual traffic
T-Mobile... 4:18 PM 93%
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SolarSystem
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T-Mobile... 4:19 PM 91%
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Louvre Lens
App St... 4:15 PM 98%
IFA BOOK APP
BASIC DIVINATION
THE 5 BASIC POSITIONS
ALAFIA
YES
EJIFE
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No Service 12:33 PM 100%
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Nov 1
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Oct 03
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Volume
29,590,254
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+0.51%

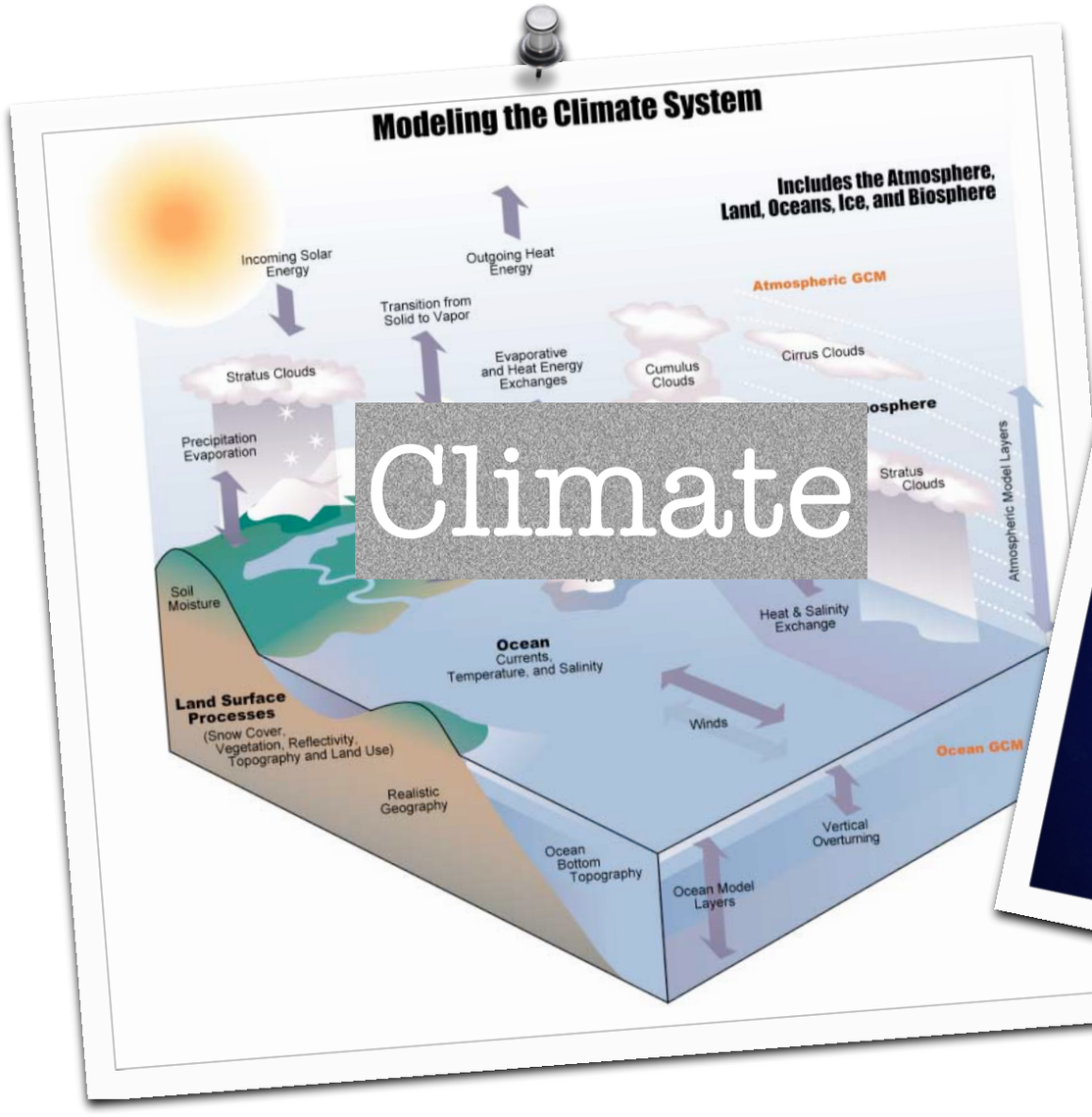
KARLOS
LIBERO

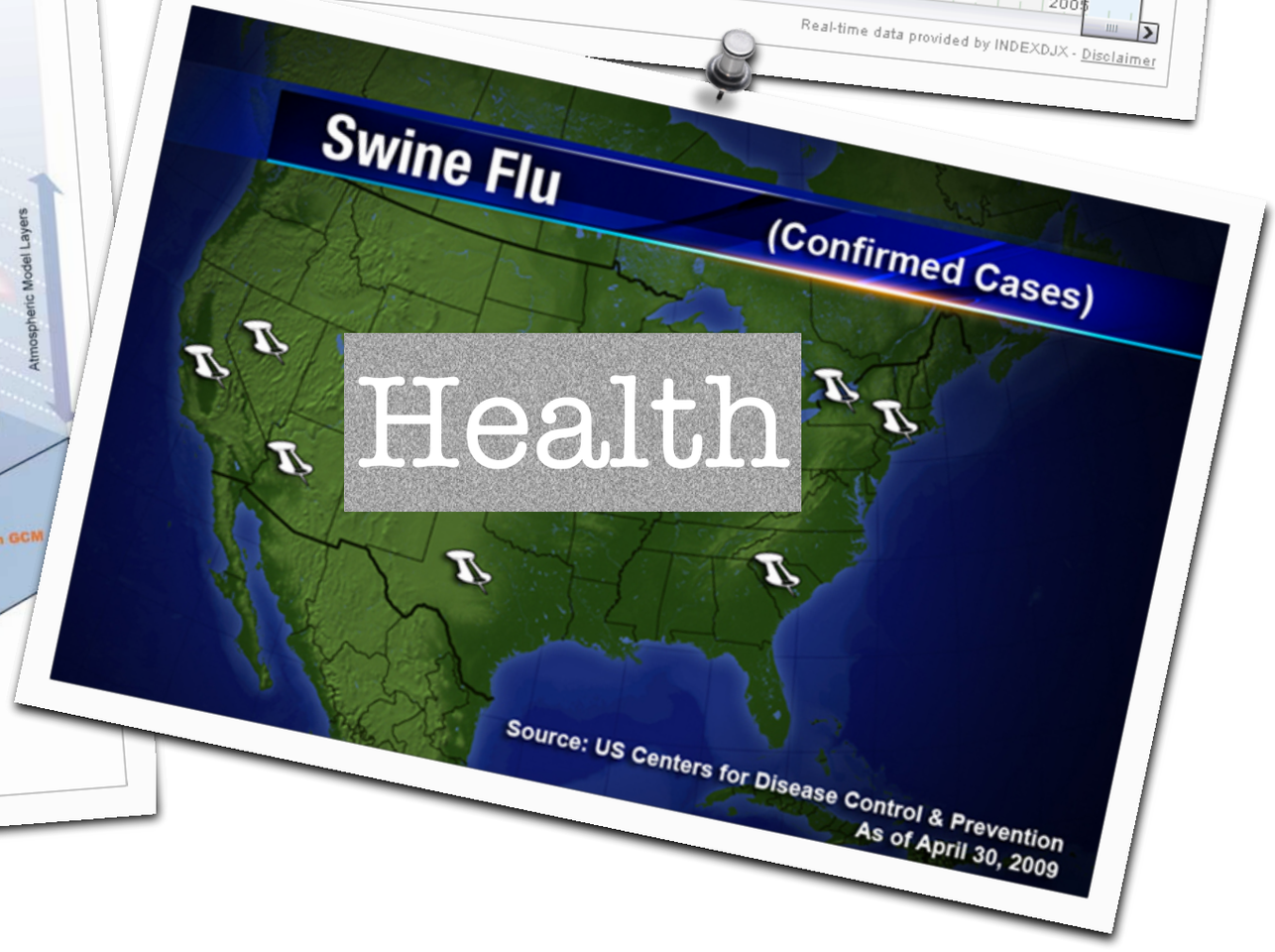
The Past

“Uncertainty, v. 2008”

thanks to Annie Valva & WGBH

WGBH THE POWER OF PUBLIC MEDIA





“The Uncertain Future” 2009

thanks to Howard Cutler (WGBH)

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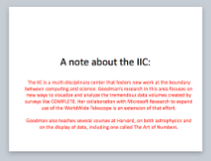

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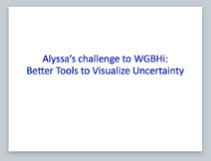

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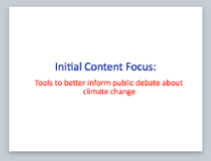

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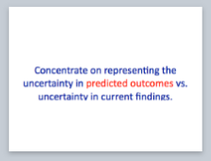

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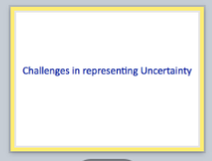

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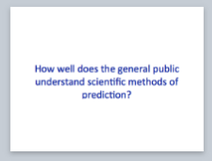

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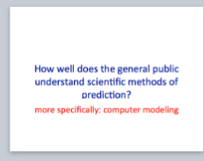

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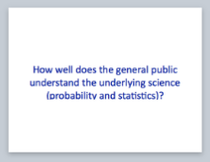

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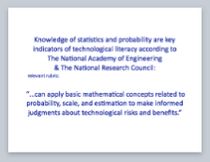

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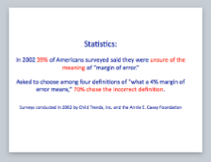

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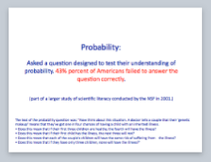

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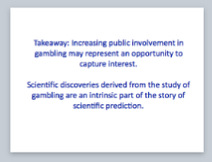

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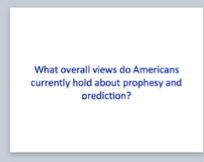

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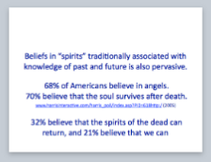

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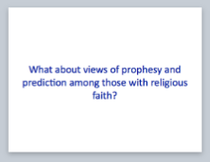

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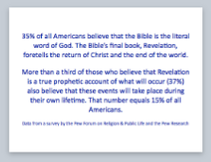

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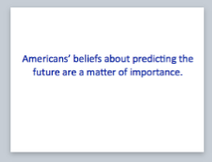

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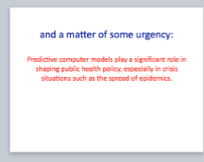

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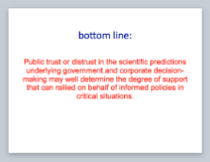

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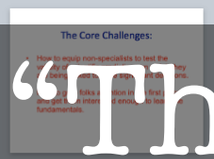

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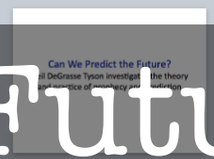

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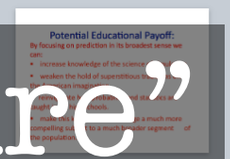

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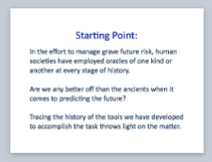

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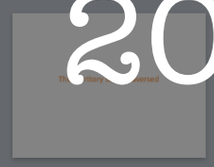
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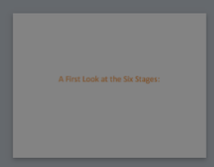

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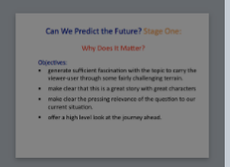

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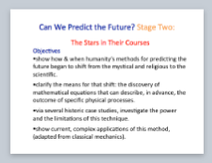

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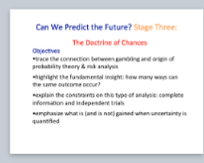

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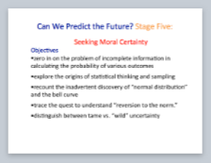

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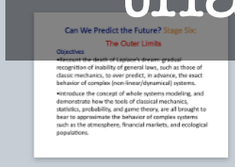

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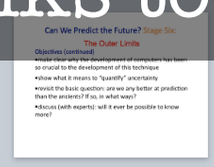

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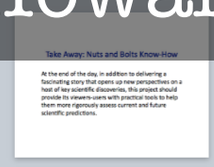

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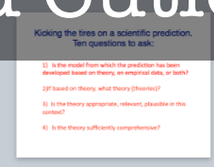

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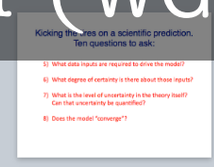

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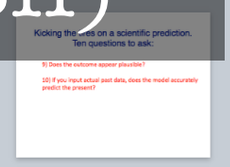

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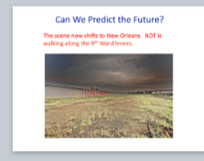

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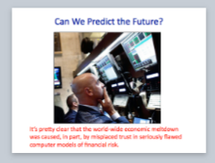

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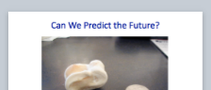

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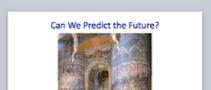

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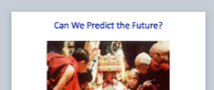

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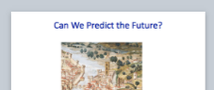

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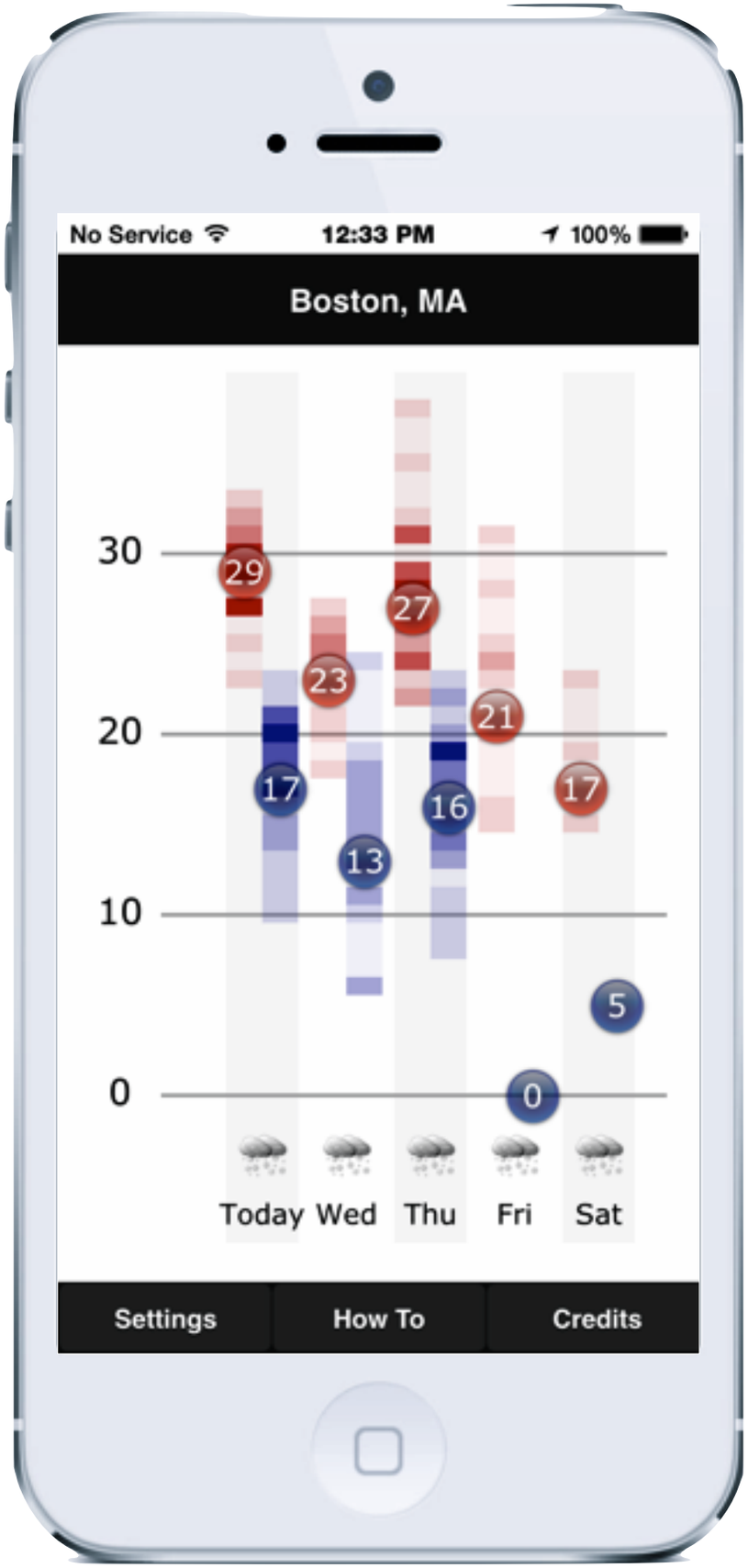
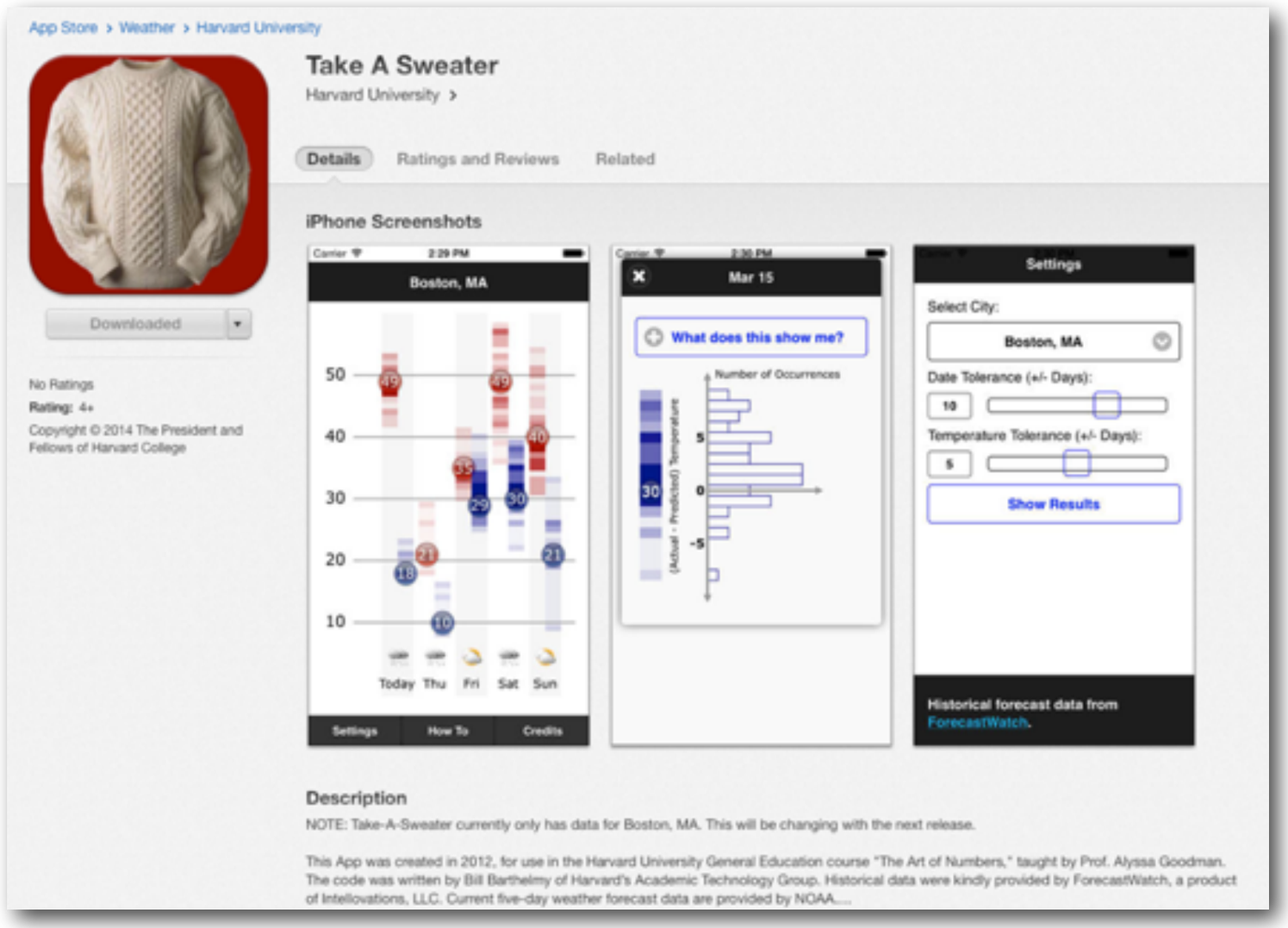
“Take a Sweater,” 2012





takeasweater.com, and “TakeASweater” in the Apple App Store

with thanks to Eric **Floehr** of Forecast Watchand Bill **Barthelmy** of Harvard Academic Technology Group

PredictionX, 2016

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PREDICTION THE PAST AND PRESENT OF THE FUTURE

1 Omens, Oracles & Prophecies

2 The Rise of Theory

3 Modern Simulation

Mesopotamian Haruspicy

Egyptian Priests

Roman Augury

Chinese Oracle Bones

Mesoamerican Astrology

Oracle of Delphi

Yoruba Ifa

Tent Tarot

Christian Prophecy

Greek Astronomy

Comets of Doom

The Path to Newton

Baghdad's House of Wisdom

Navigation

John Snow & Cholera

Epidemiology

Personal Genomics

Climate Change & Earthquakes

Finance

The Universe

Divination Tent

The Futures of Our World

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The Futures of Our World

TIMELINE TOOL, INTERACTIVE MAPS (EARTH & SKY), ANNOTATION TOOL(S)

Systems Framework, "Golden Threads," Practitioner's Guide , Philosophical Traditions, Data Collection & Study Design

PREDICTION THE PAST AND PRESENT OF THE FUTURE

1 Omens, Oracles & Prophecies

- Mesopotamian Haruspicy
- Egyptian Priests
- Roman Augury
- Chinese Oracle Bones
- Mesoamerican Astrology
- Oracle of Delphi
- Yoruba Ifa
- Tent Tarot
- Christian Prophecy

2 The Rise of Theory

- The Path to Newton
- Greek Astronomy
- Baghdad's House of Wisdom
- Navigation
- Comets of Doom

3 Modern Simulation

- John Snow & Cholera
- Epidemiology
- Personal Genomics
- Climate Change & Earthquakes
- Finance
- The Universe
- Divination Tent
- The Futures of Our World

TIMELINE TOOL, INTERACTIVE MAPS (EARTH & SKY), ANNOTATION TOOL(S)

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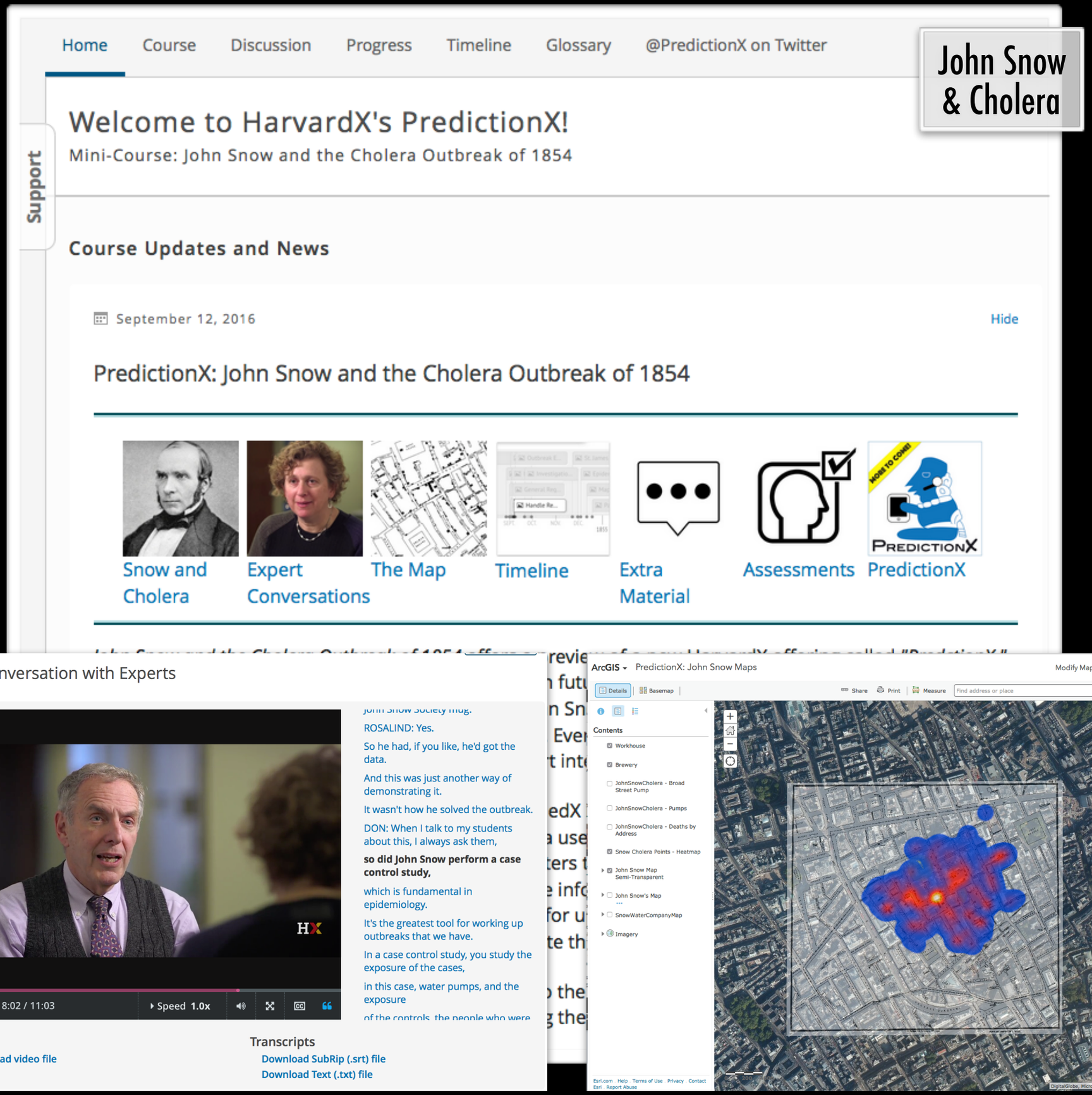
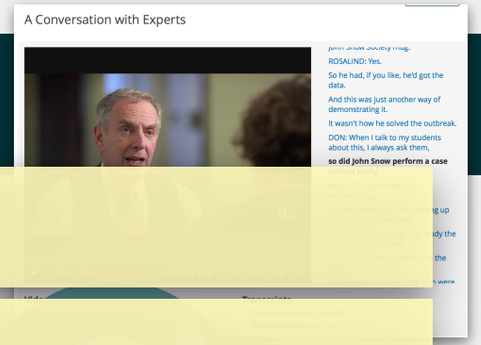
"Mini-Course" John Snow & Cholera



featuring Don Goldmann, Alyssa Goodman (host) & Rosalind Stanwell-Smith

Making use of learning #tags



Tech Tools

Pedagogica Views

1. Data collection

#before vs #during vs #after

e.g. measure planet positions to predict orbits

e.g. measure shaking in an earthquake

e.g. interview lung cancer victims

#active vs #passive

e.g. by survey

e.g. by GPS

#study vs #ad-hoc

e.g. pre-designed Framingham Nurses' Study

e.g. mining patient medical records

2. Study design

#hypothesis vs #empirical

e.g. cholera is water-borne

e.g. what could be making people sick with cholera?

#time-tracking

e.g. Cohort study, Halley's Comet

#comparative

e.g. Case-control: drug treatment vs. non-drug

3. Study goal

#description

To reduce complexity of data collected e.g. represent data with a fitted function

#probabilistic prediction

Inherently random (e.g. sports outcomes) or with randomness caused by reducible uncertainty (e.g. climate change)

#deterministic prediction

Using a tested, predictive theory that agrees with observation to within measurement error (e.g. gravity)

Full “Course”/Book

“Parts”

Topics & Mini-Courses

Tech Tools

Pedagogical Views

Pedagogical Views

processes open to human influence

e.g. Oracle of Delphi

#non-random

using devices

e.g. pickup sticks

#randomized

deterministic phenomena

e.g. motion of planets

#deterministic

OBSERVE PHENOMENA

(often repeatedly)

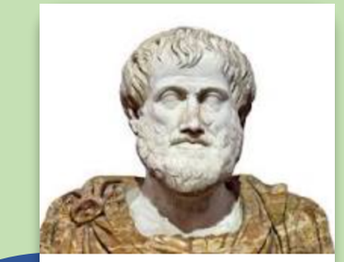
"#random"

apparently random phenomena

e.g. flight of birds

create, refine or apply

PREDICTIVE SYSTEM



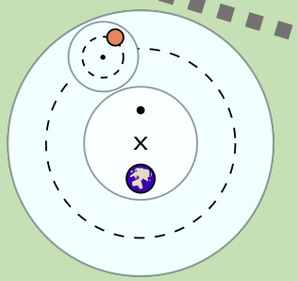
Aristotle

IMPROVE SYSTEM

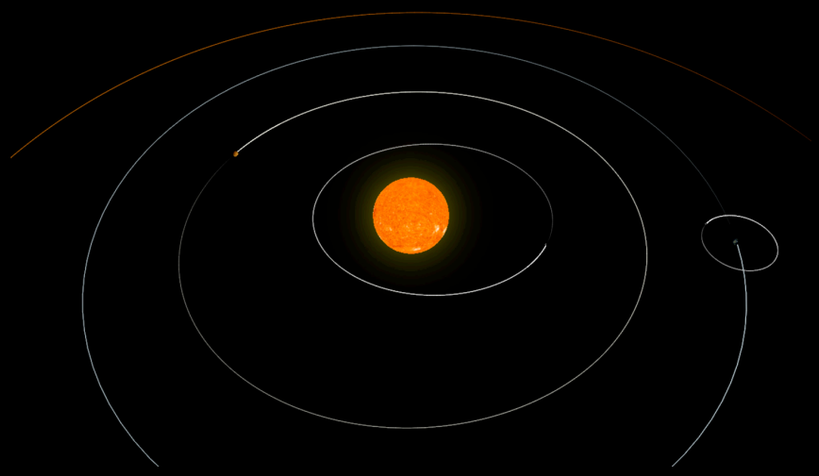
MAKE PREDICTION

MEASURE SUCCESS

accuracy or influence



#deterministic



Celestial Motion

#randomized

Ifa

#non-random

Egyptian “Bobble Head”

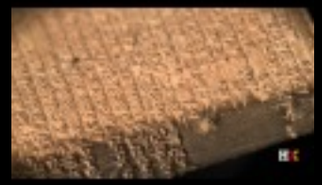
“#random”

Comets of Doom

#non-random

Ancient Egyptian Divination, featuring Peter der Manuelian (FAS & Semitic Museum)

income
housing
water



Owen **Gingerich**
Professor Emeritus of Astronomy and History of Science

Sara **Schechner**
Curator of Historical Scientific Instruments

Peter **Manuelian**
Professor of Egyptology & Director of Harvard Semitic Museum (FAS)

Piotr **Steinkeller**
Professor of Assyriology (Department of Near Eastern Language & Civilizations, FAS)

Emma **Dench**
Professor of Ancient and Modern and of the Classics (Department of the Classics, FAS)

Laura **Nasrallah**
Professor of New Testament and Early Christianity (HDS)

Jacob **Olupona**
Professor of African Religious Traditions (both FAS and HDS)

John **Overholt**
Curator of Early Modern Books and Manuscripts, Houghton Library

David **Carrasco**
Professor of the Study of Latin America (both FAS and HDS)

Rowan **Flad**
Professor of Archaeology (Anthropology Department, FAS)

John **Huth**
Professor of Science (Physics Department, FAS & Co-Director of Science, Radcliffe)

Don **Goldmann**
Professor in the Department of Immunology and Infectious Disease (HSPH)

Emilie **Hardman**
Research, Instruction & Digital Librarian, Houghton Library

[and several more to come, thanks!]

Harvard Art Museums

Fogg Museum
Busch-Reisinger Museum
Arthur M. Sackler Museum

#randomized

Early Christian Divination, featuring Laura Nasrallah (HDS)

Full “Course”/Book

“Parts”

Topics & Mini-Courses

Tech Tools

Pedagogical Views

Pedagogical Views

Our Need to Know

Human beings have an inherent curiosity about future events. We want to know - we need to know what's going to happen to us, to our homes and loved ones, to our world a whole. This can drive us to learn more about our universe, but it can also leave us open to manipulation by others. When you see the Crystal Ball Mind icon, nearby material will illuminate humanity's fascination with the future and the way in which we react to predictions.

Key Questions:

- Where does our desire to know the future come from?
- How do we react to predictions?

Cognitive Biases

Sometimes the incredible, complex human mind can make equally complex errors. We pay attention to irrelevant details; we see patterns where they don't exist; we even reject information that contradicts our beliefs. Cognitive biases are the ways in which our mental shortcuts and heuristics get in our way. When you see the Tipped Scales icon, nearby material will point out the thought patterns that lead us to less accurate predictions, including over-generalization, confirmation bias, illusions of control, and the gambler's fallacy.

Key Questions:

- When does human nature get in the way of making an accurate prediction or recognizing a bad one?
- How has bias shaped our predictions and our response to them?

Subjective Analysis

To be widely accepted, predictions must be more than accurate – they must be appealing. Human beings judge predictions on more than just an objective basis. We apply skepticism, question believability, and look for the utility value in the things we hear. When you see the Heart-and-Mind icon, nearby material will speak to our emotional evaluation of predictions and the things that human beings choose to value.

Key Questions:

- How do human beings choose what predictions to value?
- What determines how strongly we act on a prediction?

The Observation/Theory Cycle

The Cycle icon refers to humans' unceasing endeavor to create theories that explain the patterns they observe around them. Sometimes individuals who create the theories also seek to test them, but other times, they love their theories so much that they leave the testing to future generations.

Key Question:

- How do human beings formalize the patterns that we see in our observations?

Who's Making the Prediction?

Every culture agrees that predictions are best made by experts. However, different traditions disagree on what makes one an expert. Some prognosticators are highly trained, while others are chosen (or cursed) by the gods. Many traditions require both divine blessing and worldly preparation. When you see the Yin-Yang icon, nearby material will explore prediction as an intuitive or teachable process, and investigate the nature of both diviners and those who interpret their predictions.

Key Questions:

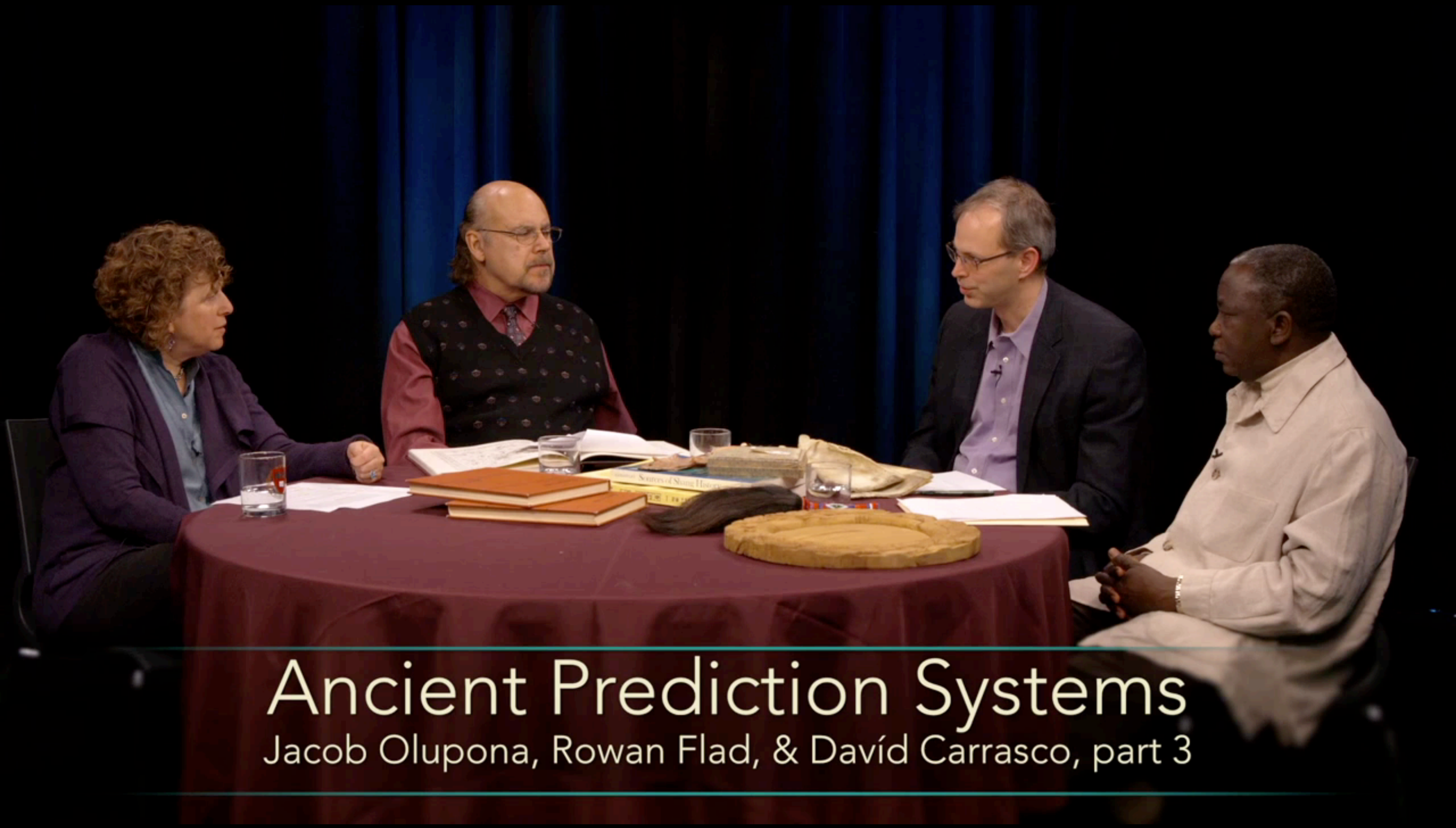
- Why are certain individuals uniquely qualified to make certain predictions?

The Hidden Nature of our Universe

Every prediction is made in context. Whether this context is our planet's climate, an economic market, the orbits of comets, or our own social networks, the rules of these systems are at the heart of our ability to understand them. The nature of our universe is at the very heart of prediction. When you see the "cracked eye" icon, nearby material will deal with concepts such as free will, determinism, and probability; natural or supernatural laws; the invisible hand of the market; and the root source of uncertainty.

Key Questions:

- What properties of our universe make it possible to predict the future?
- What makes it difficult to predict the future?



Ancient Prediction Systems, featuring David Carrasco (HDS), Rowan Flad (FAS) & Jacob Olupona (HDS)

Pedagogical Views

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So, we are taking an opportunistic approach…

en.wikipedia.org/wiki/Methods_of_divination

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Contact us
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Upload file
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Methods of divination

From Wikipedia, the free encyclopedia

This article is about the numerous varieties of divination. For divination as a whole, see Divination.

This article **has an unclear citation style**. The references used may be made clearer with a different or consistent style of citation, footnoting, or external linking. *(December 2013) (Learn how and when to remove this template message)*

Innumerable **methods of divination** can be found around the world, and many cultures practice the same methods under different names. During the Middle Ages, scholars coined terms for many of these methods — some of which had hitherto been unnamed — in Medieval Latin, very often utilizing the suffix *-mantia* when the art seemed more mystical (ultimately from Greek *mantis*, prophet) and the suffix *-scopia* when the art seemed more scientific (ultimately from Greek *skopein*, to observe). Names like *dhrimimantia*, *nigromantia*, and *horoscopia* turned up, along with a slew of other esoteric (and distinctly Medieval) "sciences" such as phrenology and physiognomy.

Of course, some forms of divination are much older than the Middle Ages, like haruspication, while others (such as megapolisomancy or coffee-based tasseomancy) are born of the 20th and 21st century.

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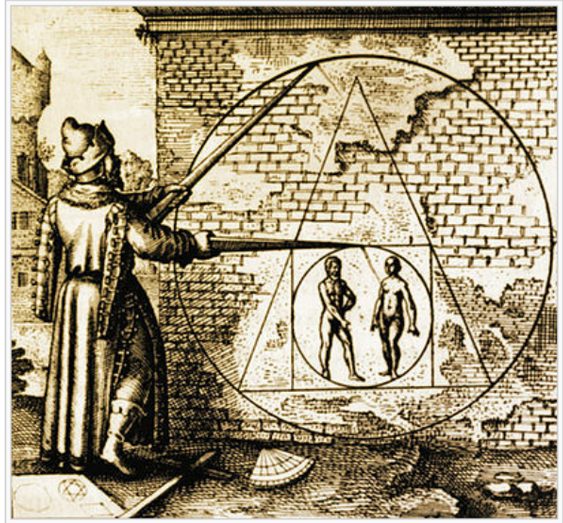
A [edit]



An arithmancer from *Atalanta Fugiens* (1618), by Michael Maier

- **abacomancy** /ˈæbəkoʊmænsi/ (also **amathomancy**): by dust (Hebrew *ʿābāq*, dust + Greek *manteia*, prophecy)
- **acultomancy** /əˈkʌltoʊmænsi/ (also **acutomancy**): by needles (from *acutomancy* below, influenced by Latin *acūleus*, needle)
- **acutomancy** /əˈkjuːtoʊmænsi/ → see ACULTOMANCY (Latin *acus* [*acut-*], needle + Greek *manteia*, prophecy)
- **adromancy** /ˈædroʊmænsi/ → see ALOMANCY (from *idromancy* below, influenced by *alomancy*)
- **adryomancy**→ see HYDROMANCY (metathesis of *hydromancy*)
- **aeromancy** /ˈɛroʊmænsi/: by atmospheric conditions (Greek *āēr*, air + *manteia*, prophecy)
- **agalmatomancy** /əˈgɔːlmətoʊmænsi/:[*citation needed*] by statues (Greek *agalma* [*agalmat-*], statue + *manteia*, prophecy)
- **aichmomancy** /ˈɛkmoʊmænsi/: by sharp objects (Greek *aikhmē*, spearhead + *manteia*, prophecy)
- **ailuromancy**/**aeluromancy** → see THERIOMANCY
- **alectormancy**/**alectromancy** /əˈlɛktroʊmænsi/: by rooster sacrifice (Greek *alektor*, rooster + *manteia*, prophecy)
- **alectryomancy**/**alectoromancy**: by rooster divination → see THERIOMANCY
- **aleuromancy**[1] /əˈljʊəroʊmænsi/: by flour; see also CHARTOMANCY (Greek *aleuron*, meal + *manteia*, prophecy)
- **alomancy**/**Halomancy** /ˈæloʊmænsi/ (also **adromancy**): by salt (Greek *hals*, salt + *manteia*, prophecy)
- **alphitomancy**/ˈælfɪtoʊmænsi/: by barley (Greek *alphis* [*alphit-*], barley + *manteia*, prophecy)
- **alveromancy** /ælˈvɪəroʊmænsi/:[*citation needed*] by sounds
- **amathomancy** /ˈæməθoʊmænsi/ → see ABACOMANCY by sand (Greek *amathos*, sandy soil + *manteia*, prophecy)
- **ambulomancy** /ˈæmbjʊloʊmænsi/: by walking (Latin *ambulāre*, to walk + Greek *manteia*, prophecy)
- **amniomancy** /ˈæmnioʊmænsi/: by placenta (Greek *amnion*, amnion + *manteia*, prophecy)
- **anemoscopy**/**anemomancy** /ˌænɪˈmɒskoʊpi/: by wind (Greek *anemos*, wind + *-skopiā*, observation)
- **anthomancy** /ˈænθoʊmænsi/: by flowers (Greek *anthos*, flower + *manteia*, prophecy)
- **anthracomancy** /ˈænθrəkoʊmænsi/: by burning coals (Greek *anthrax* [*anthrak-*], charcoal + *manteia*, prophecy)
- **anthropomancy** /ænˈθrɒpoʊmænsi/: by human sacrifice (Greek *anthrōpos*, human being + *manteia*, prophecy)
- **anthroposcopy** /ænθroʊˈpɒskoʊpi/: by physical appearance (Greek *anthrōpos*, human being + *-skopiā*,

“Prediction” Freshman Seminars, 2015

James Leonard, artist

Sara Schechner
Collection of Historical Scientific Insturments

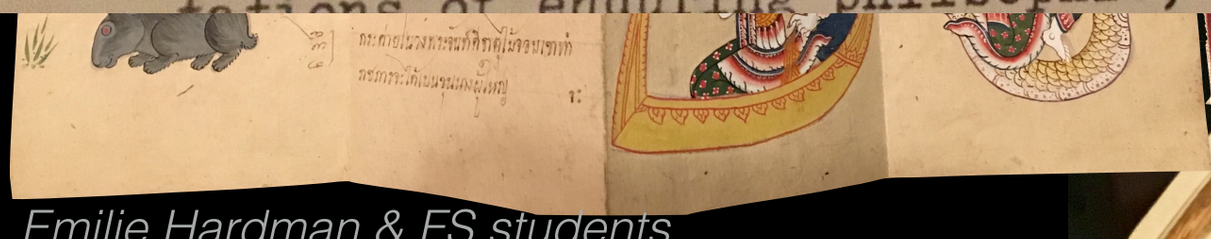
Emilie Hardman,
Houghton LIbrary

(by Timothy Leary)

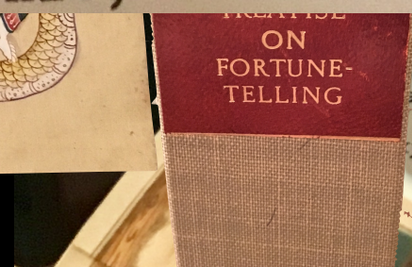
2.6 The Essence Meaning of the Tarot Has Been Concealed By Deliberate and Accidental Distortions

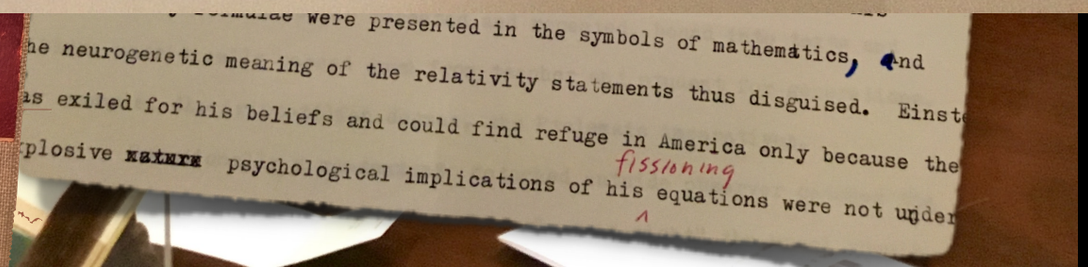
The Tarot cards deck is an ancient formula of neurogenetic symbols which has been passed down over the centuries. A complex psychological signal of this sort which persists in time across many generations somehow must have some neurogenetic meaning, must relate to modern scientific energy models.

Occult systems are time-scripts, neurogenetic messages sent across ~~the centuries.~~ millennia. They are crude, blurred, short-hand descriptions of energy processes, psychophysical formulae, compressed and purified representations of enduring philsophic, alchemical (i.e. neurochemical) principles.



Emilie Hardman & FS students





Chinese Oracle Bones, featuring Prof. Rowan Flad (FAS)

PredictionX @ Radcliffe Institute for Advanced Study, Harvard University

Radcliffe Research Partners on Prediction, 2016

Paul **Banks**
Origins of political prediction, Simulmatics

Cengiz **Cemaloglu**
Diviners' guides & Coffee Grounds

Philip **Chowdry**
The philosophy of prediction over time

Henna **Hundal**
The Personal Genome Project

Mac **Sum**
Visual design

Mirac **Suzgun**
Adaptive tagging

Emily **Zhu**
Epidemiological simulations

Did Aristotle "belive in" signs from the gods?

Emma Dench (FAS) commenting on the Greek & Roman gods

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Mesopotamian Haruspicy

Egyptian Priests

Roman Augury

Chinese Oracle Bones

Mesoamerican Astrology

Oracle of Delphi

Yoruba Ifa

Tent Tarot

Christian Prophecy

Greek Astronomy

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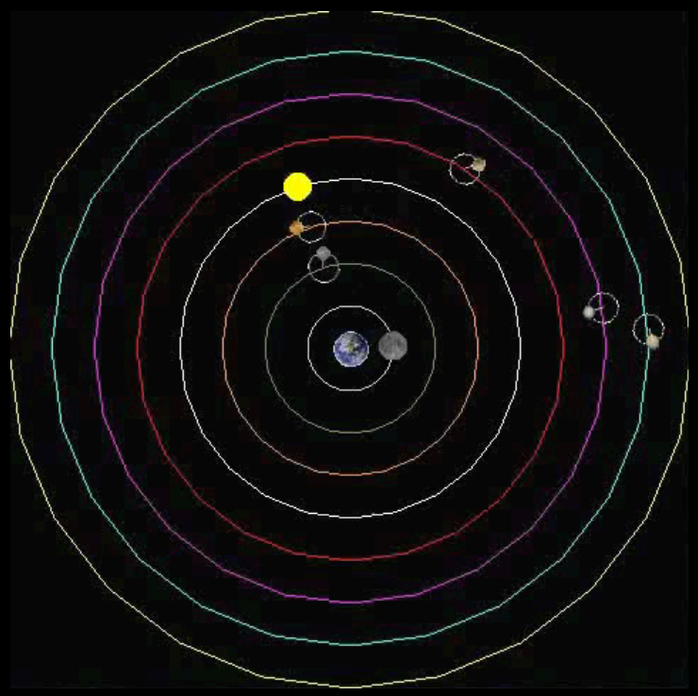
Ptolemaic

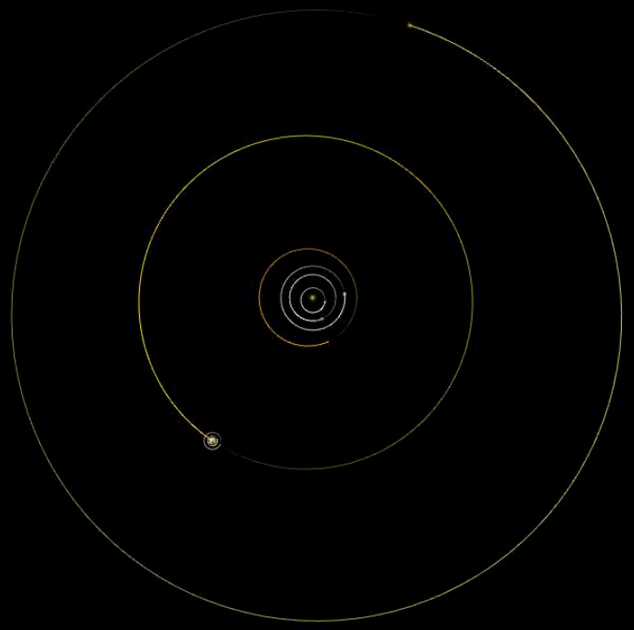
Geocentric,
with Epicycles



150 A.D.

Copernican

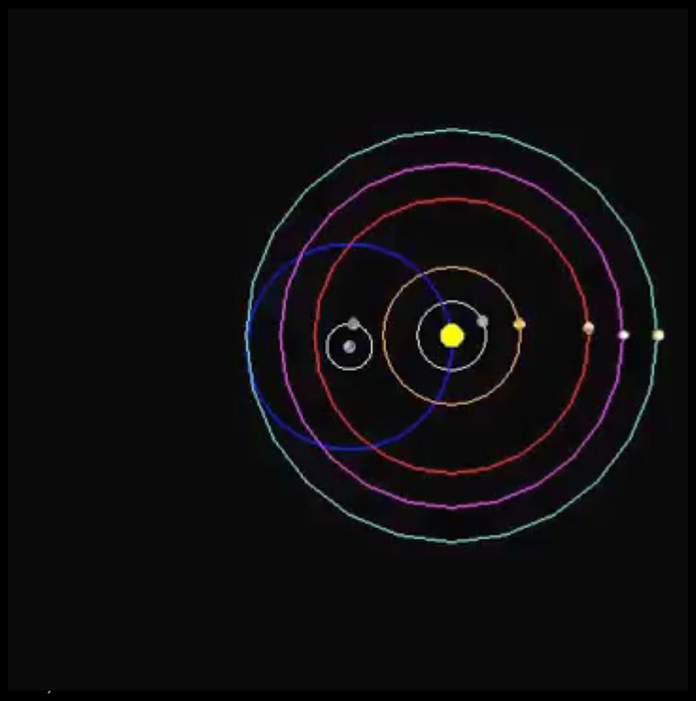
Heliocentric
(correct)



1543

Tychonic

Geoheliocentric
hybrid



1587

(diagrams are not to scale)

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Greek Astronomy

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Comets of Doom

The "Path to Newton" (& Longitude)

Greek Astronomy

Baghdad's House of Wisdom

The Path to Newton

Comets of Doom

Navigation

The Bārûtu

(or, *What do sheeps' livers have to do with Isaac Newton?*)

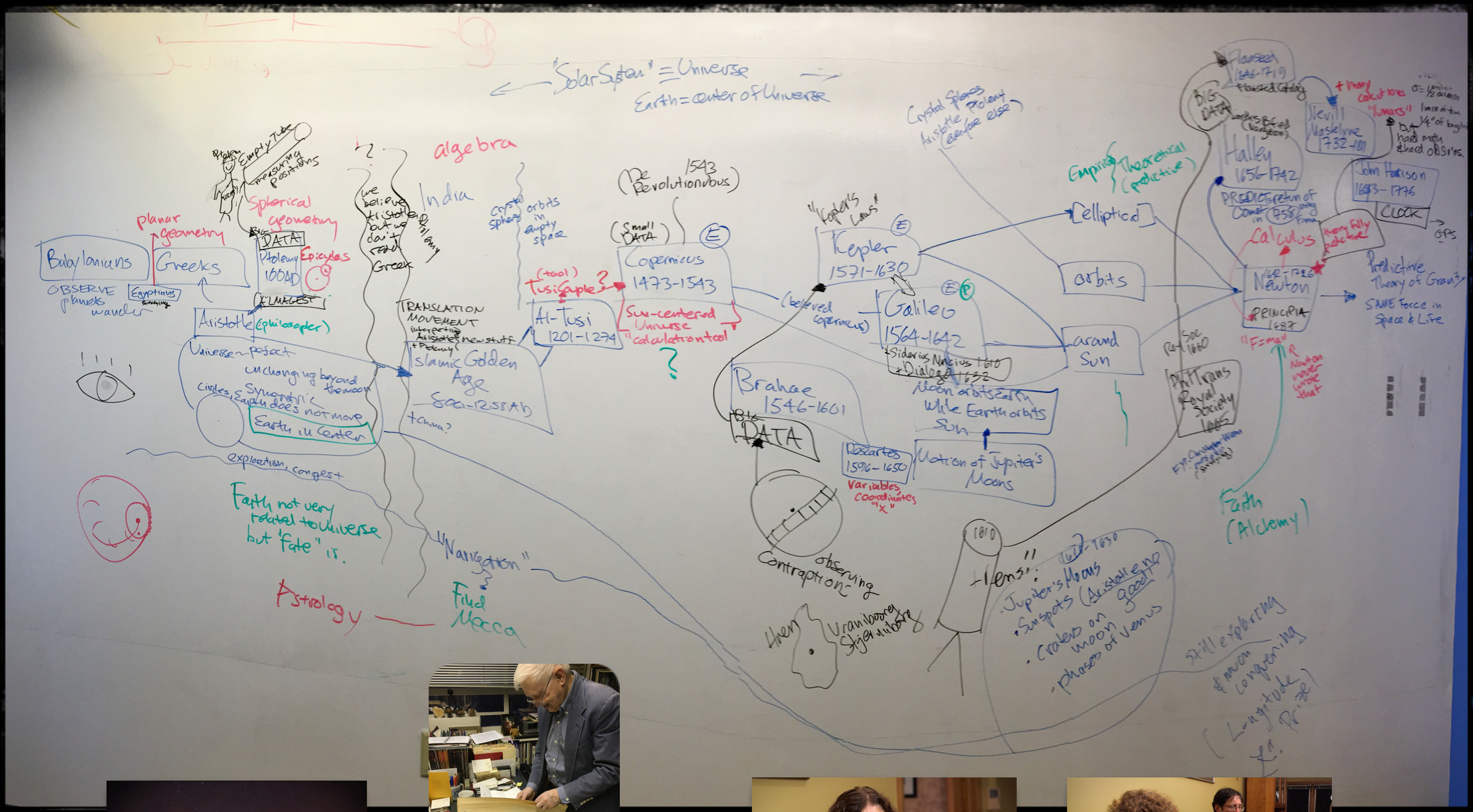
Models of divinatory livers
19th-18th century BC
Palace of Mari
(from the Louvre collection)

ETRUSCAN LIVER OF PIACENZA

http://www.louvre.fr/en/oeuvre-notices/model-liver-divination

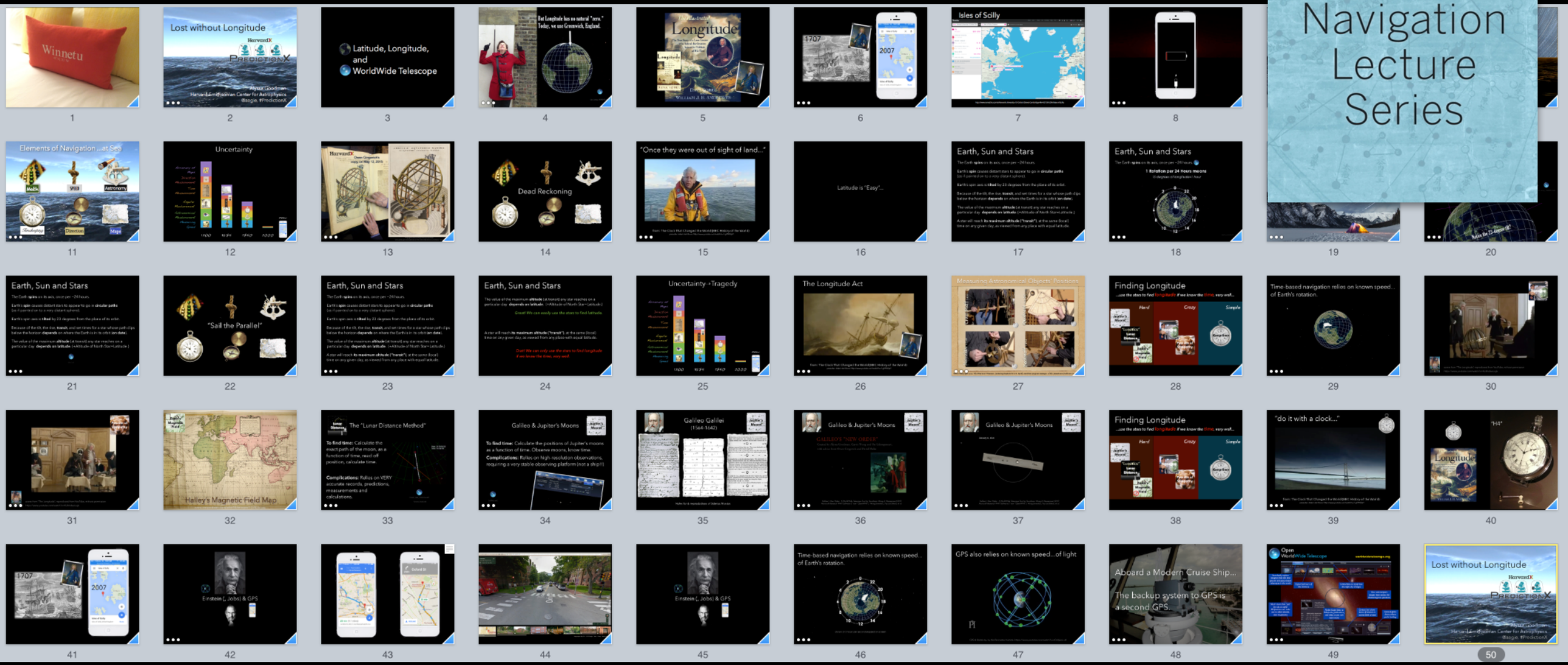
Modèles de foies divinatoires
© 1982 RMN / Christian Jean

The "Path to Newton" (& Longitude)



PREDICTIONX

Lost without Longitude

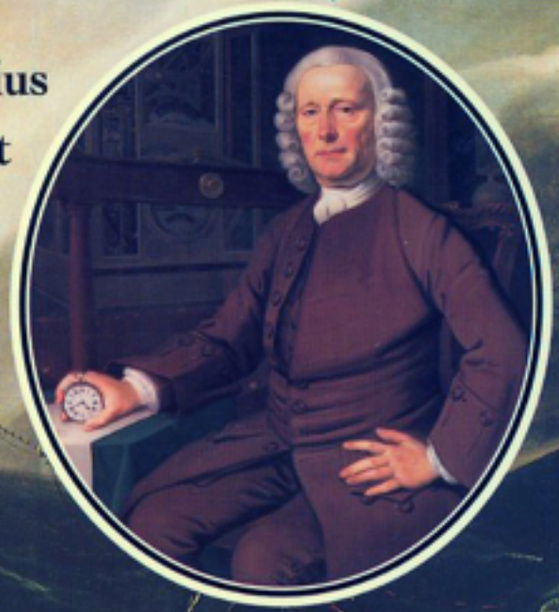


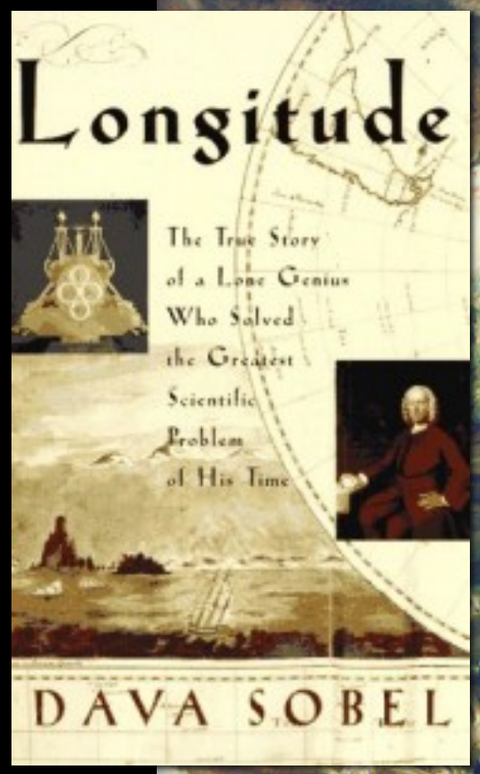
(now) featuring Owen Gingerich, Alyssa Goodman (host), John Huth, Chris Lintott, Rory McEvoy, Keith Moore, Martin Rees, Simon Schaffer, Sara Schechner, Dava Sobel, Curtis Wong

Lost without Longitude

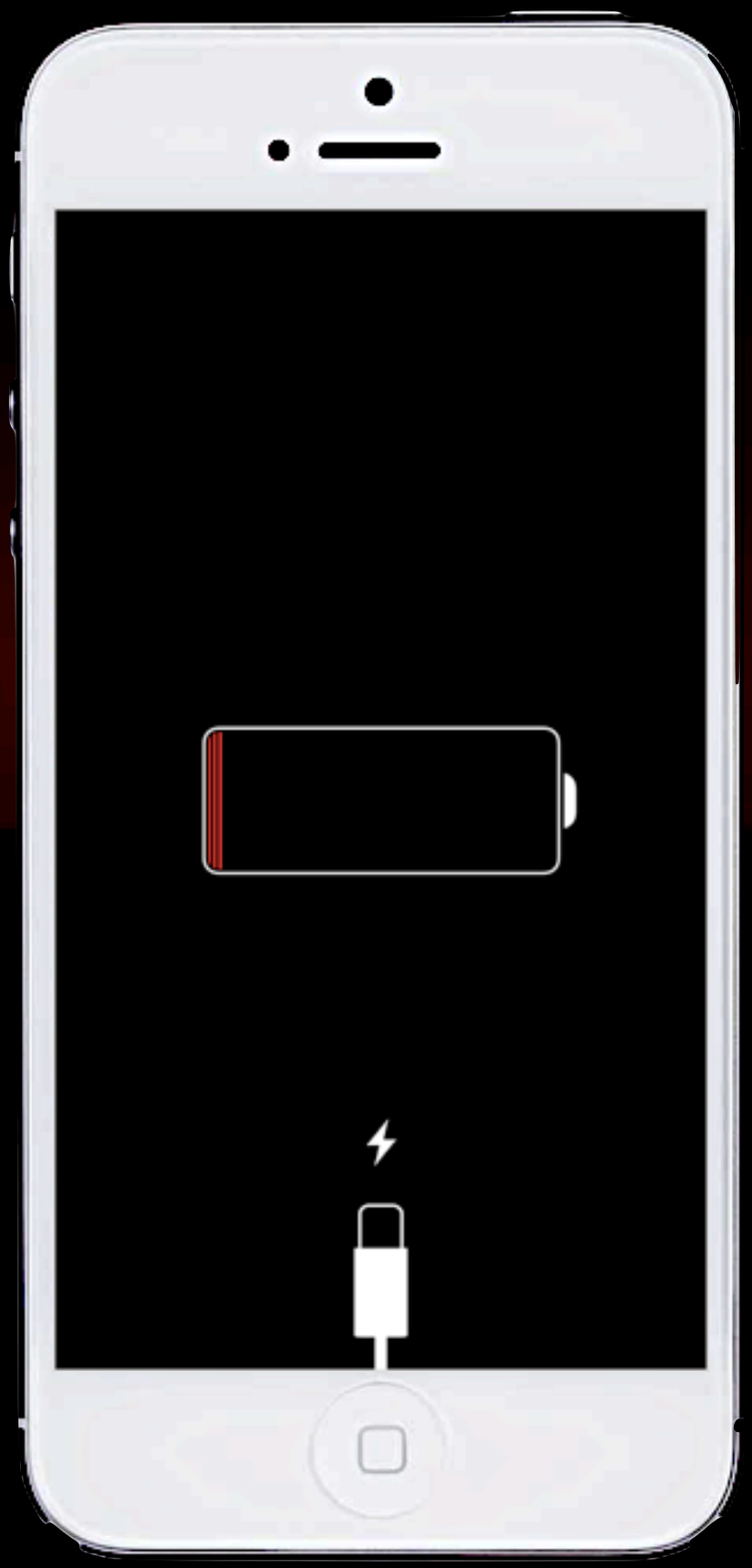
The Illustrated Longitude

The True Story of a Lone Genius
Who Solved the Greatest
Scientific Problem
of His Time





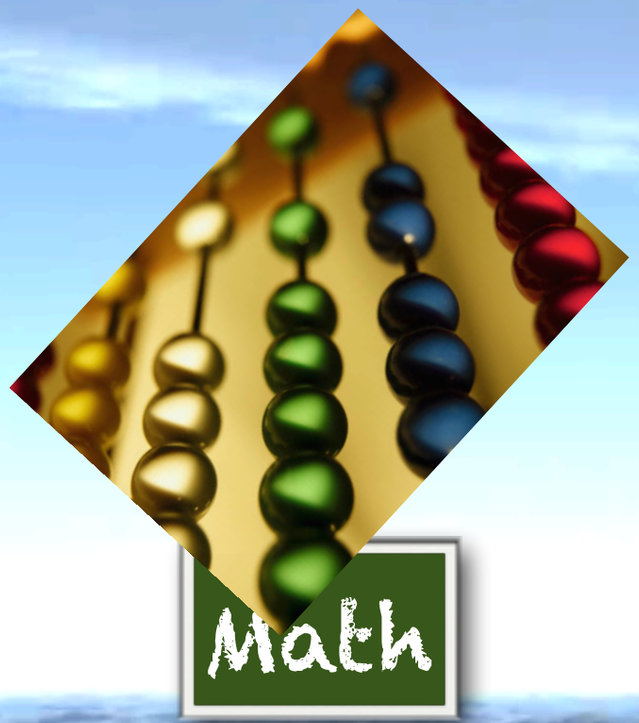
DAVA SOBEL
AND
WILLIAM J. H. ANDREWES

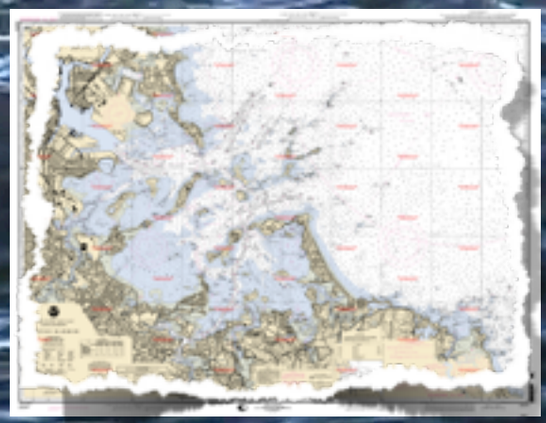


Skymarks

Landmarks

Elements of Navigation ...at Sea





Uncertainty

Accuracy of Maps

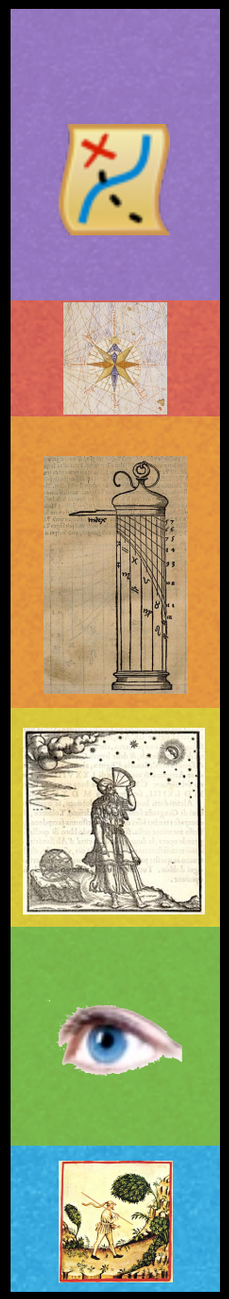
Direction Measurement

Time Measurement

Angular Measurement

Astronomical Measurement

Measuring Speed



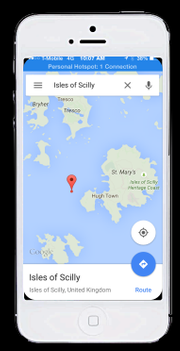
1200

1675

1750

2000

now

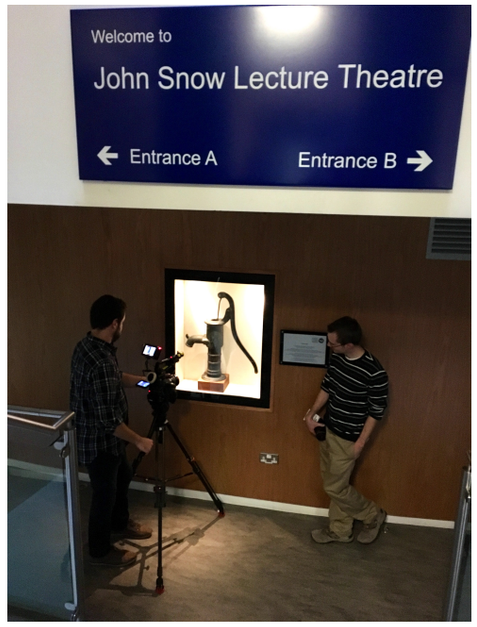


PREDICTIONX

ROYAL OBSERVATORY GREENWICH

THE ROYAL SOCIETY

UNIVERSITY OF CAMBRIDGE



LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE

PREDICTIONX

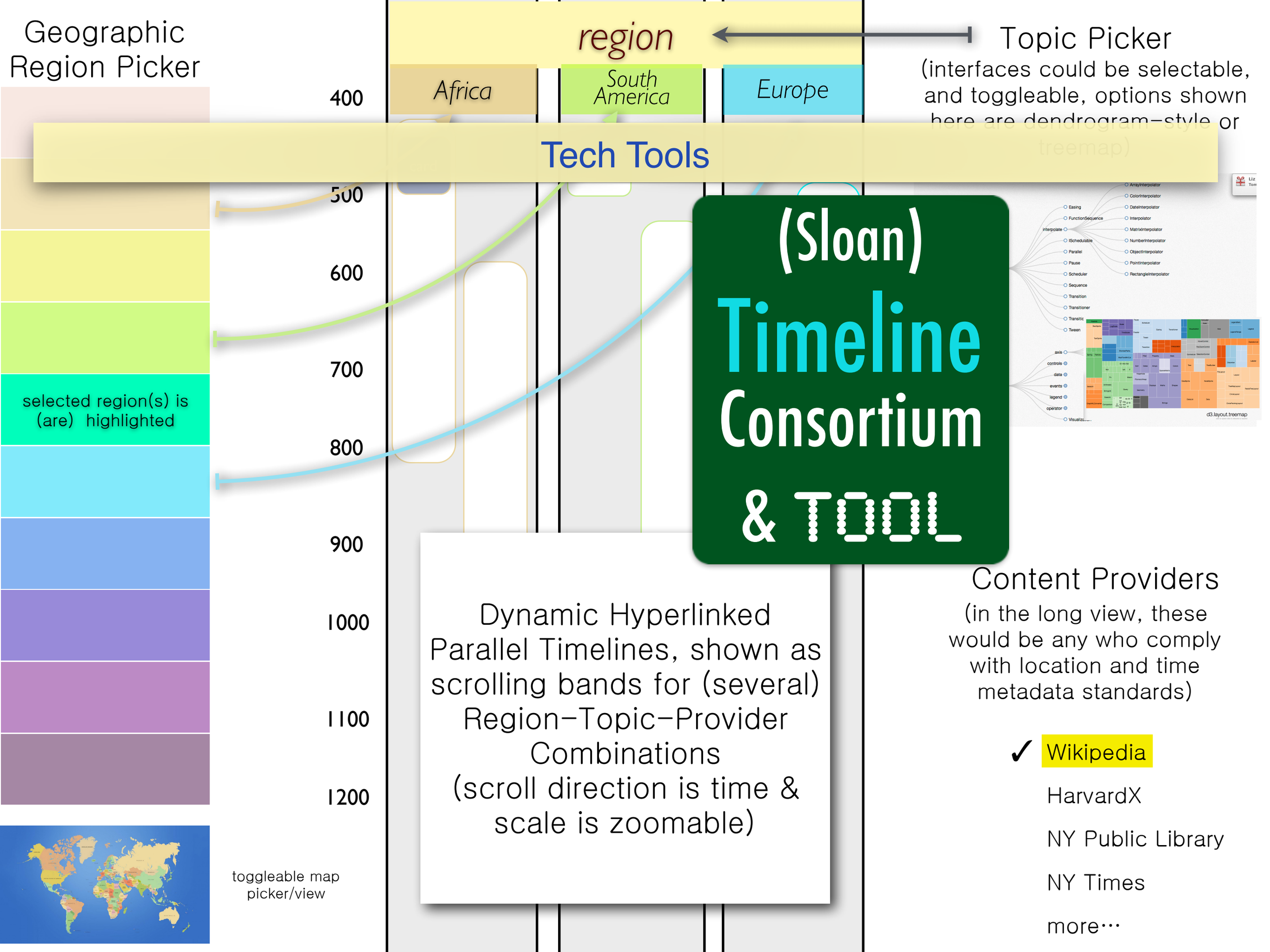
Full “Course”/Book

“Parts”

Topics & Mini-Courses

Tech Tools

Pedagogica Views


Geographic Region Picker
region
Africa
South America
Europe
Topic Picker
(interfaces could be selectable, and toggleable, options shown here are dendrogram-style or treemap)
Tech Tools
400
500
600
700
800
900
1000
1100
1200
selected region(s) is (are) highlighted
toggleable map picker/view
(Sloan) Timeline Consortium & TOOL
Dynamic Hyperlinked Parallel Timelines, shown as scrolling bands for (several) Region-Topic-Provider Combinations (scroll direction is time & scale is zoomable)
Content Providers
(in the long view, these would be any who comply with location and time metadata standards)
✓ Wikipedia
HarvardX
NY Public Library
NY Times
more…

PredictionX beyond Harvard

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Executive Producer (WGBH, retired)

James **Leonard**
Independent Artist

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Professor of Astrophysics, Oxford University

Rory **McEvoy**
Curator of Horology, Royal Observatory Greenwich

Keith **Moore**
Librarian, Royal Society

Martin **Rees**
Emeritus Professor at Cambridge, and Astronomer Royal

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Teaching Fellow

Allyssa **Metzger**
Teaching Fellow

with special thanks to Rob **Lue** (HX Faculty Director), Samantha **Earp** (HX Executive Director), and Jon **Alper** (HX Technical Operations Manager)

The SHEEP of DESTINY

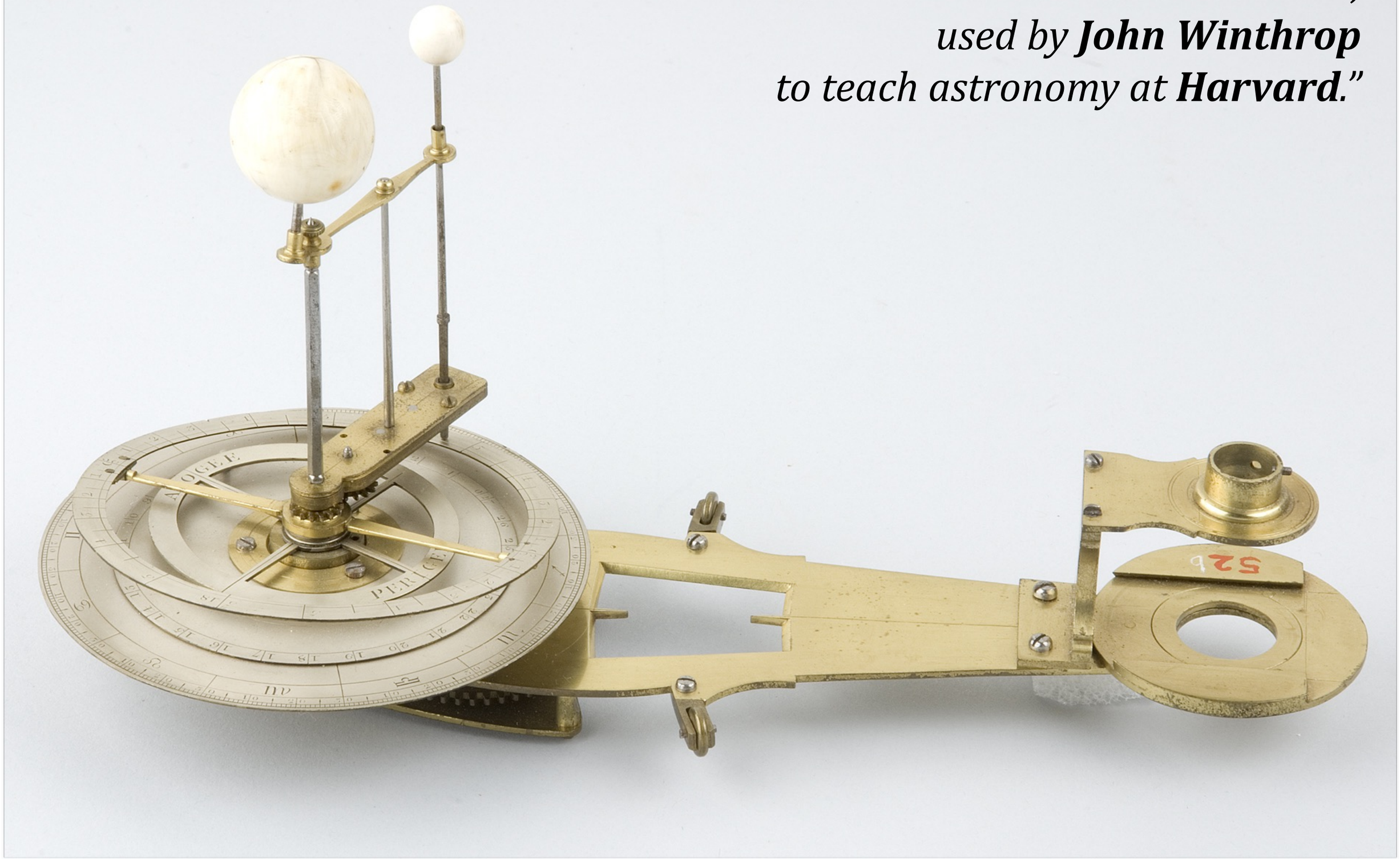
He SMILES because he sees your future.

And Oh, how HAPPY shall that future be!

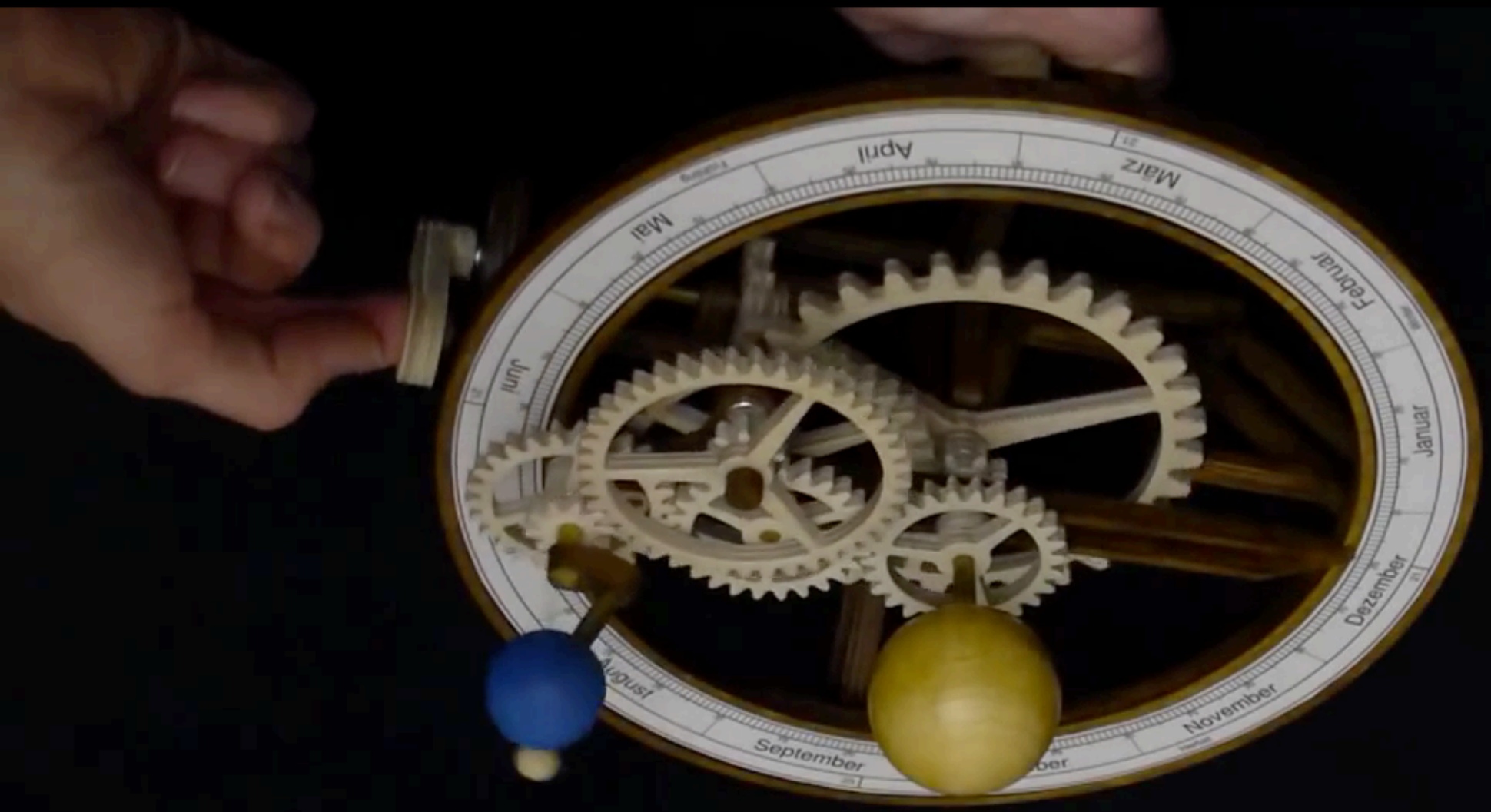
EDWARD MONKTON © Portobello Rights Ltd.

Stars seen as ‘eyes of night’ observed by an astronomer, whose eye is stretched from its socket; (Maya) Codex Madrid, pl. 34

*"A **tellurion** made in 1766,*
*used by **John Winthrop***
*to teach astronomy at **Harvard**."*

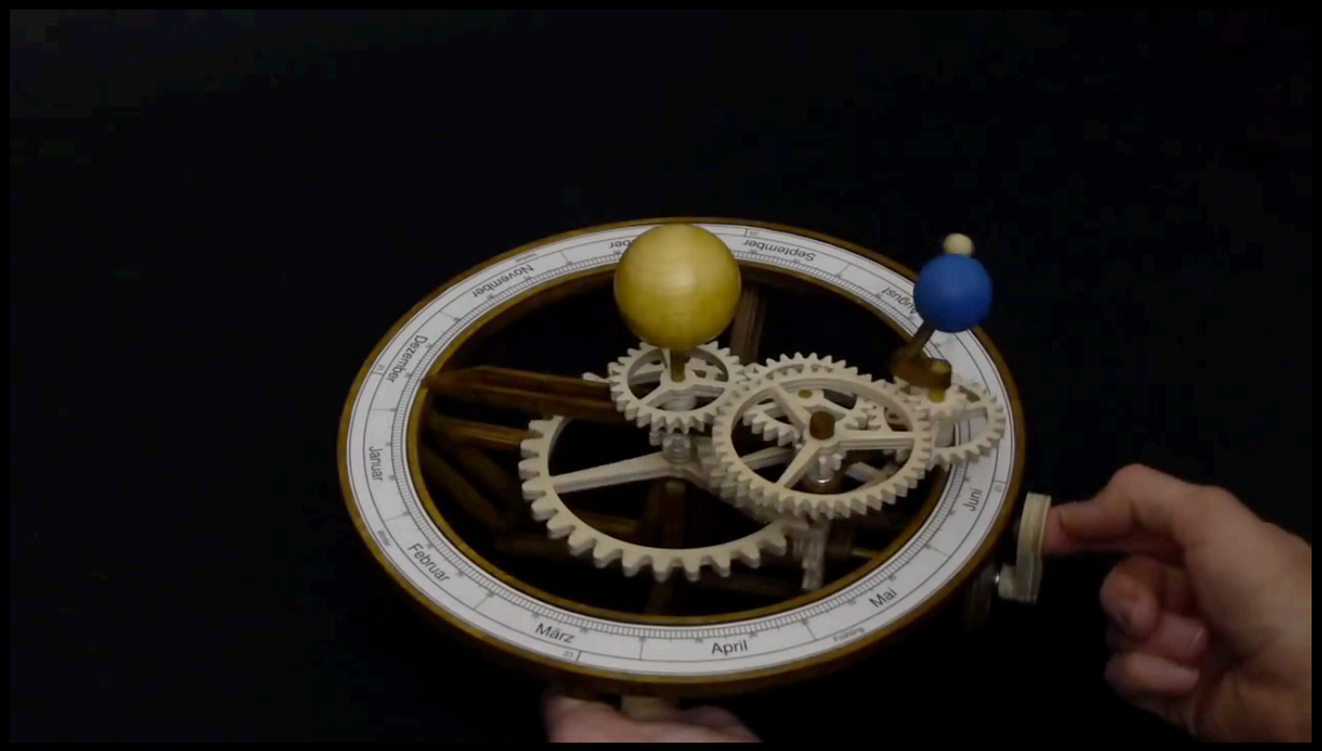


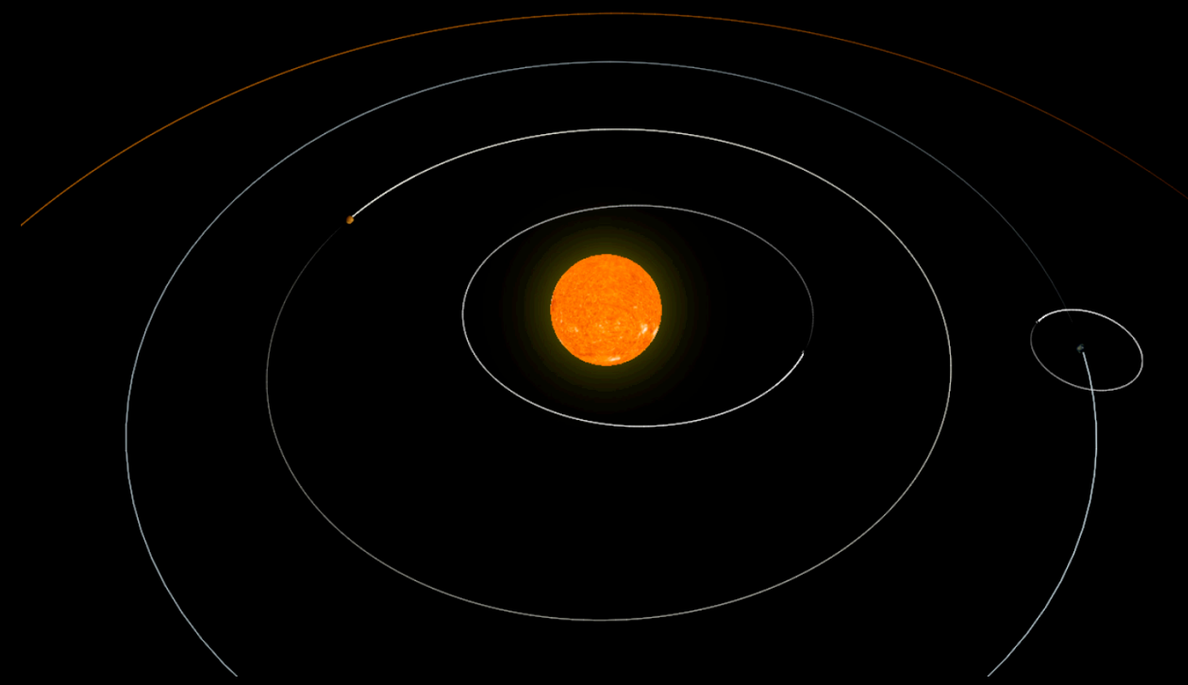
[part of the Collection of Historical Scientific Instruments in the Harvard University Science Center]


Januar
Februar
März
April
Mai
Juni
Dezember
November
September
August

Tellurion, Holz Mechanik

WorldWide Telescope





Overview of PredictionX