

Humanism, optimism, and the story of flight

Astronomy 101
Syracuse University, Fall 2020
Walter Freeman

October 29, 2020

Announcements

Next Tuesday is the last day to vote in the US. This means:

- Labs will not be held next Tuesday
- Class will be recorded and the recording posted promptly
- If you are serving as a poll worker or doing other volunteer work for a campaign, your group may have an automatic extension on Project 4
- Any student who needs assistance voting should contact me after class

Announcements

Project 4 is posted.

- This involves you looking at last year's exam and writing a study guide
- We covered the last of the material on it on Tuesday
- You should start it early; don't wait until the evening before it is due!

I have gotten lots of mail requesting extensions on things. In general, we will be tolerant of people's circumstances, although I am overloaded by mail and can't write everyone back. If you will be late on your paper, for instance:

- Turn it in as soon as you can
- Include a description of why it is late in your submission email
- We'll take a look at it

The dream of flight / Il sogno di volare

Italian text: Leonardo da Vinci

Music by Christopher Tin

The Royal Philharmonic Orchestra, the Angel City Chorale, Prima Vocal Ensemble, and Lucis: London, July 2016

Una volta che avrai
spiccato il volo, deciderai
sguardo verso il ciel saprai:
lì a casa il cuore sentirai

Once you have taken flight
you'll decide
Gaze toward the sky: you'll know that
that is where your heart will feel at home

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Prenaderá il primoro volo
verso il sole il grande uccello
sorvolando il grande monte cereri
riempendo l'universo di stupore e gloria.

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The first great bird
will take flight towards the sun,
sweeping over the great Mt. Ceceri,
filling the universe with wonder and glory.

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L'uomo verrá portato dalla sua creazione
come gli uccelli, verso il cielo...
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Man (sic) will be lifted by his own creation,
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Gloria!

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Glory!

The victory lap

We've studied what's up there, how it works, and how we see it.

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You've learned some chemistry, some physics, some geology, some geometry, and – yes – some math, and I'm proud of you.

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You've learned some chemistry, some physics, some geology, some geometry, and – yes – some math, and I'm proud of you.

Along the way, we've learned quite a lot of the *history of humanity*.

Many thousands of years ago:

- We understood the regular patterns of the stars and Moon and Sun in the sky
- ... used them to keep time and to navigate
- ... but were terrified of unpredictable things, like comets and eclipses
- ... used them to motivate myths and legends and traditions
- ... and sought a better understanding of the motions of the planets, leading to Ptolemy's model of the heavens

Around five hundred years ago:

- People sought to refine Ptolemy's model based on experience
- ... gathered even better data, observed with new tools and in new ways, and discovered how the Solar System really works
- ... in the process, developed the *scientific method*
- ... and, along the way, developed *physics*, leading to rapid progress in science

Around a century ago:

- People realized that the light coming from the Sun tells us its composition
- ... that the light coming from other stars tells us their composition, too
- ... that our planet is made of the stardust scattered to the cosmos by an exploded star long ago

An awareness of our place in the Universe...

We've now learned our place in the Cosmos:

- Our planet is one of eight around the Sun
- We and our eight siblings are all children of an exploded star
- All the other stars, in ours and other galaxies, work just like ours
- Our Universe is fourteen billion years old, and our solar system 4.5 billion...
- ... our species is young, but only in a few thousand years we've learned this!

... but what can we *do* with that knowledge?

Humanism and agency

Many old traditions focus on the limits of human capability:

- “Don’t dream too big; we’ll never be better than we are now”
- “We are weak and our lives are short”
- “Our place is on the ground down here, not up there in the sky with the birds and the stars”

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- “We get to choose our own fate”
- “If we want a better society, it’s up to us to build it, and we can!”

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- “We get to choose our own fate”
- “If we want a better society, it’s up to us to build it, and we can!”
- “If we want a better Church, it’s up to us to build it, and we can! (Erasmus)”
- Humans are pretty awesome; let’s act like it!

The dream of flight

People have dreamed of flying for ages, in all countries and since the earliest days of history.



- Often our dream of flight was a symbol of hubris: “mortals should know their place”
- Icarus and Daedalus...

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Leonardo da Vinci (Italian, 1452-1519):

- Embodied the humanist spirit of the Renaissance: “yes, we *can!*”
- Skilled at science, philosophy, engineering, and art
- ... and used them all to enhance each other
- Like so many others, dreamed of flying...
- Was a Ninja Turtle, or my childhood was a lie



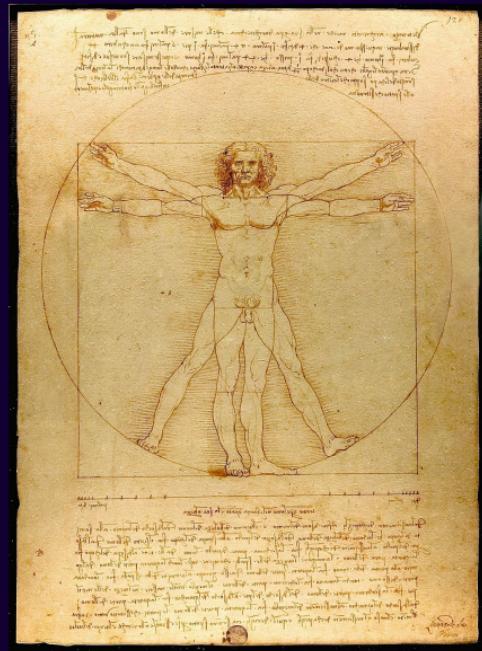
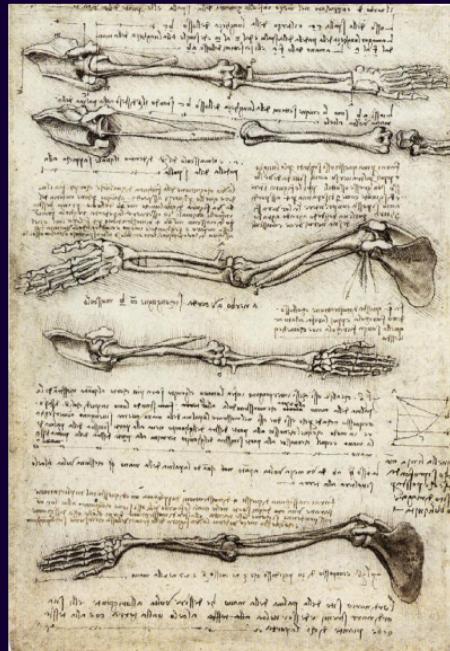
The “Renaissance man” (and woman!)

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Science as a liberal art

There's a reason this class is in the “College of Arts and Sciences”.

Understanding the world around us was once “natural philosophy” – another branch of the unified whole of learning.

Some of you may go on to become doctors – not of physics or literature or engineering, but *philosophy*.

“Science” just means knowledge: *Suos cultores scientia coronat...*

It's not “science and the liberal arts” – science *is* a liberal art.

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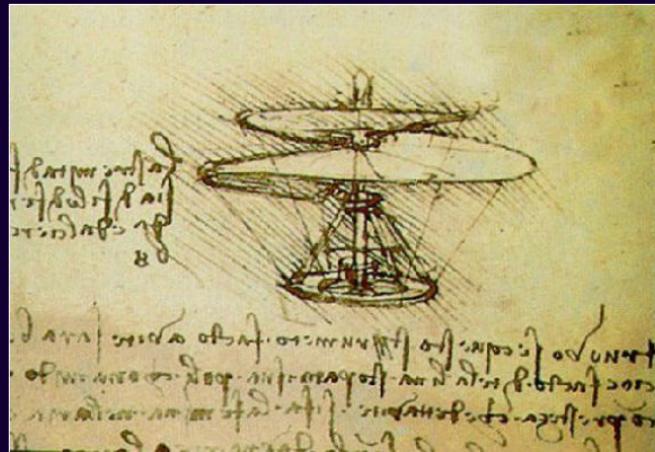
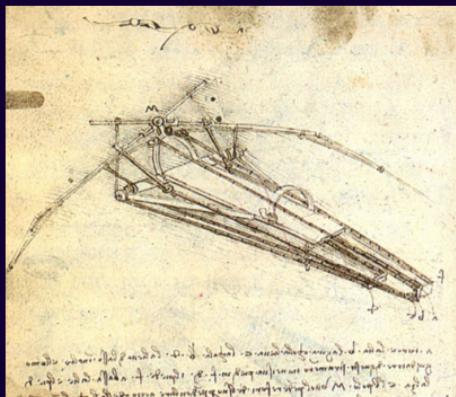
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When you can, be like da Vinci...

da Vinci and flight

da Vinci dreamed of flying, and wrote a treatise on birds – and made diagrams for flying machines.



Unfortunately, people don't just lack wings – they lack enough power.

(Human: 60 kg, 400 watts; duck, 1 kg, 100+ watts)

That's 14 times more power per gram for the duck!

Power + wings = flight!

Push yourself forward, use wings to push downward on the air (flapping or not), and you can fly!

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In 1903 Wilbur and Orville Wright put an internal combustion engine on a winged machine, put a propeller on the front, added devices to steer, and invented the airplane.

Humanism and agency

Throughout history there have always been people who say, loudly:

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... but do we know how it ends?

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... We don't – we're still writing it, and we're hopefully still near its beginning!

But you know the next chapter:

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Launch of Apollo 8, the first time people left Earth's orbit