One with the Cosmos

A short tour out your backdoor

Shane L. Larson
Department of Physics
Utah State University
s.larson@usu.edu

Utah State University
Senior University
Utah State
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Storyline

- Seeing the Cosmos one on one
- Near to Home: Solar System
- Looking outward: the Stars
- Books and more
A Personal Voyage

- Astronomy is a very personal activity, a direct connection between you and the Cosmos.

- Astronomy has a long history of discovery by "amateurs".

- It is among the only remaining sciences where ordinary citizens still make contributions.

- Journey begins right out your backdoor.
You interact with the Cosmos through your eyes — seeing is discovering. **Astronomy is a spectator sport!**

Instruments like binoculars and telescopes help, but are not required!
Daytime Astronomy

- Astronomy is not just a nighttime activity!
- You can get plenty of rest and still enjoy the sky!
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One lonely star spirals through the galaxy, dragging with it an entourage of planets, asteroids, comets and moons

This is home: the family of the Sun

As Cosmic Explorers, we have only barely stepped out into the neighborhood

Why look at what’s out there?
Earth

- NASA: It’s about life on Earth.
- This is home — there are 100 billion galaxies, and a billion trillion stars, but this is the only world we know of with life.
- It is, as far as we know, unique. Best to understand it as much as we can.
- Dave Scott (commander of Apollo 15) once justified the risk of landing at Hadley-Appenine on the Moon: “Hadley has something the other sites don’t... grandeur. I think there’s something to be said for exploring beautiful places. It’s good for the spirit.”
The Moon

- Our nearest neighbor is the easiest to see.
- To the naked eye, the phase changes on a monthly basis.
- The surface is light (the highland “terrae”) and dark (the lowland “maria”).
- The light and dark contrast are most often seen as images.
Moon Shadows
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The Red Planet

- Only 15 light-minutes away, we find a world not unlike our own
- Solid, rocky surface, geologic features, polar ice caps, and an atmosphere. This world is **Mars**
- It has the largest volcano in the solar system: 3x higher than Mount Everest and the size of Washington state. We call it **Olympus Mons**
- It has a 5000 km long canyon that would stretch from Los Angeles to New York city, called **Valles Marineris**
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The Giant Worlds

- Beyond Mars, 80 light minutes from home, we find enormous worlds of gas, without surfaces to stand on.

- **Jupiter**, the King of the Planets, shepherds its own family of strange worlds, and boasts a storm twice the size of Earth that has persisted since humans invented the telescope!

- **Saturn** bears majestic rings that are easily seen from Earth. A billion tiny snowballs ringing the planet, but whose origins are unknown.
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The Fringes

- Beyond Saturn, our inspection of the solar system has been *cursory*

- **Neptune** was discovered in 1846; its rings were unknown until the 1980s.

- We were ignorant of **Pluto’s** existence until only a century ago; its moon, Charon, was discovered in 1979. No spacecraft has ever visited Pluto.

- Even this close to home, the Cosmos is **virtually unexplored**
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To the stars...

- Beyond our solar system, we cross distances that we cannot hope to traverse in a human lifetime.
- The stars **outnumber** all other objects in the galaxy; they are the body of our home, the Milky Way.
- They come in many types and colors.
- Massive stars *age quickly*, and **die young**.
- Smaller stars, like our Sun, enjoy long lives.
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Clusters of stars...

- Stars often appear in groups, like **the Pleiades**
- As time passes, they drift apart and into the galaxy
- Despite their great distance, the stars have a **profound effect on our psyche.**
Stellar nurseries

- The gas we see around the Pleiades is a hint to where they came from.

- Throughout the galaxy, we encounter vast clouds of gas and dust called *nebulae*.

- This is the Orion Nebula, 1500 lightyears from Earth, and visible to the naked eye.

- This is one of Nature’s secret places — *the birthplace of stars*.
Flying through the Orion Nebula
The Milky Way

- We can see the Milky Way stretching overhead on clear evenings – the **Backbone of Night**

- The dark lanes are vast molecular clouds – the **future stars** of our galaxy

- The faint light is the combined light from 400 billion stars

- In all this vastness, Earth is still the only planet we know that harbors life.
Some last thoughts

- Carl Sagan once wrote (Cosmos): “The desire to be connected with the Cosmos reflects a profound reality: we are connected. Not in trivial ways... but in the deepest ways.”

- The enormous grandeur of the Comsos is, in many ways, beyond our grasp, but we can share in it every day and every night by simply looking around us every time we walk out the door.
Some books to read more...

COSMOS
by Carl Sagan

Coming of Age in the Milky Way
by Timothy Ferris