

Of Comets, Cats, and External Advisors

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Background

- originally from western Massachusetts (not Boston!)
- went to undergrad at Williams College
- obtained PhD from New Mexico State University
- working with Anita Cochran on cometary spectroscopy

A Common Misconception

- Q: Why are comets boring to study?

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A Common Misconception

- Q: Why are comets boring to study?
- A: Because they are always in a coma!
- Actually, the fact that they are in a coma makes them very interesting and challenging objects to study!

Coma and Tail Formation

- Sublimation of surface ices results in the formation of the coma and tails



Image Credit: E. Kolmhofer, H. Raab;
Johannes-Kepler-Observatory, Linz, Austria

Why Study Comets?

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- Comets have a primitive composition that has undergone very little change since their formation
- Knowledge of cometary composition can yield constraints on planetary formation models

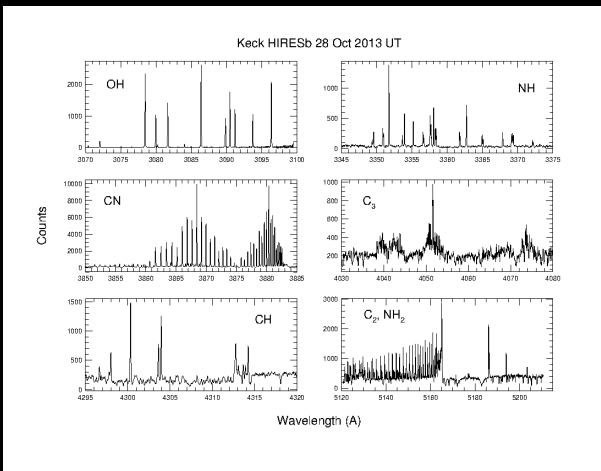
Why Study Gas Production?

- Knowledge of volatile composition of comets increases our understanding of volatile formation in the protosolar nebula
- These volatiles include water and organic precursors, both of which are necessary for life as we know it!
- Coma blocks view of the nucleus from Earth
- Must study gas production in the coma to study volatile composition of the nucleus

What I do

- high resolution optical spectroscopy
- lots of experience on ARCES at ARC 3.5-meter telescope at Apache Point Observatory, learning to use 2DCoude on the McDonald 107-inch
- using forbidden oxygen line emission as a proxy for CO₂ in comets
- understanding the photochemistry of the coma (comparison of optical and IR spectra)

Spectra!



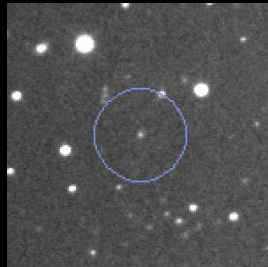
Of Comets and Cats

“Comets are like cats: they have tails, and they do precisely what they want.” - David Levy



Case in Point: Comet ISON

- discovered in September 2012 outside of Jupiter's orbit
- found to be on a sungrazing orbit, created lots of hype as "Comet of the Century"



Case in Point: Comet ISON



- light curve flattened, not getting brighter even though it was moving toward the Sun
- lost behind the Sun in Summer 2013, no observations available until August

Case in Point: Comet ISON

- recovered, fainter than expected
- activity level flattened out in October and early November, looked like it was going to fizzle



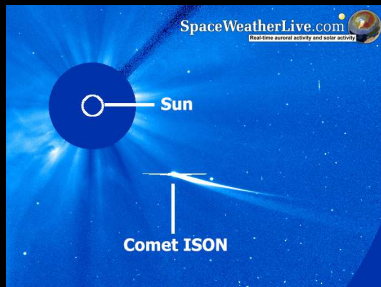
Case in Point: Comet ISON

- November 14 - increased brightness by a factor of 10!
- one of several outbursts over the next two weeks - Hope was restored!



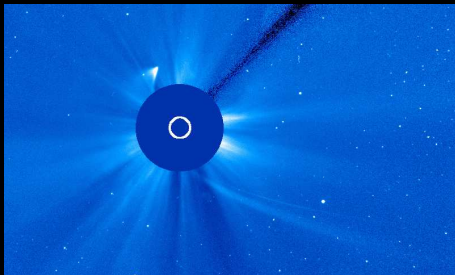
Case in Point: Comet ISON

- Perihelion on Thanksgiving
- models predicted that ISON would survive perihelion
- thought it was dead, but then something seemed to have survived . . .



Case in Point: Comet ISON

Zombie Comet!



ZOMBIE CAT

Will eat your brains.

Case in Point: Comet ISON

- **Up:** Upon discovery hailed as “Comet of the Century”
- **Down:** underperformed as it came closer to perihelion
- **Up:** major outbursts gave renewed hope
- **Up:** models predicted it would survive perihelion
- **Down:** SOHO images showed apparent disintegration event
- **Up:** something emerged post-perihelion
- **Down:** didn't survive

Case in Point: Comet ISON



Working With an External Advisor/Collaborator

- my academic advisor studied gas giant atmospheres, not comets!
- needed outside expertise
- built network of external collaborators to help me with my thesis

Collaborators

- Michael DiSanti, NASA Goddard
- Anita Cochran, University of Texas Austin/McDonald Observatory
- Jeffrey P. Morgenthaler, Planetary Science Institute
- Walter Harris, University of California Davis
- Neil Dello Russo, APL
- Ronald J. Vervack, Jr., APL
- Geronimo Villanueva, NASA Goddard
- Michael Kelley, University of Maryland
- Dennis Bodewits, University of Maryland
- Diane Wooden, NASA AMES
- Hideyo Kawakita, Kyoto Sangyo University
- Casey Lisse, APL

Pros and Cons of Working With an External Advisor/Collaborator

Pros

- can work on a topic that interests you, but is not necessarily an expertise of someone at your home institution
- networking takes care of itself!
- prepares you well to be an independent researcher

Cons

- reiteration time scale is slow (have to ask all questions by email)
- requires you to be self-motivated (external advisor will not likely hound on you everyday)

Working With an External Advisor/Collaborator

- working with external advisor/collaborator can be rewarding, but also frustrating
- I enjoyed it, but it may not be for everyone

See you at Crown!

