# Talk Abstracts & Narrative

# Goals of a talk abstract

- <u>Get folks to come to your talk</u>
- Convey an exciting problem / exciting new aspect to the field
- Convey that folks will learn something new
- Convey that there are future directions that are exciting

Event: Steward Observatory/NSF’s NOIRLab Joint Colloquium Series
Date: Thursday, Dec. 9th, 2021, 3:30 P.M. (AZ), In-Person
Speaker: Duncan Lorimer
Institution: West Virginia University

Title: Fast Radio Bursts -- An Evolving Cosmic Mystery


Abstract:

Fast Radio Bursts are millisecond-duration pulses of unknown origin that were discovered by an undergraduate student at West Virginia University in 2007. Almost fifteen years later, with hundreds of other sources currently known, an understanding of their origins is emerging but it is still far from complete. I will tell the story of their discovery, summarize what we know about them so far, describe the opportunities these bursts present, and make predictions for what we might learn in the next decade.


**Barebones Structure:** **Fact** **Problem/New Discovery (title)** **Overview of Talk** **Future Outlook**

# Writing and Reader Comprehension

- http://www.online-utility.org/english/readability_test_and_improve.jsp

Event: Steward Observatory/NSF's NOIRLab Joint Colloquium Series
Date: Thursday, Dec. 2nd, 2021, 3:30 P.M. (AZ), In-Person
Speaker: Manoj Kaplinghat
Institution: University of California - Irvine

Title: Dark matter self-interaction and its impact on galaxies


Abstract:

Self-interacting dark matter (SIDM) is a well-motivated idea with novel predictions for galactic halos and their satellites. This talk will highlight some of these motivations and predictions, including how SIDM models can explain the diversity of observed rotation curves. It will end with a summary of the current constraints and promising future probes.


**Fact**

**Problem ??? New Discovery?? The Fact is set up as a solution to a problem that has not been mentioned**

**Overview of Talk**

**Future Outlook**

LPL Colloquium Tuesday, January 25, 2022.

**Dr. Alyssa Rhoden**
Southwest Research Institute, Boulder

## Mimas, that's no (ocean) moon! Or is it?

Mimas is the innermost "regular" moon of Saturn. It's small and heavily cratered, suggesting that Mimas lacked sufficient internal heating to drive geologic activity. However, Cassini measurements of its libration require that Mimas either has a non-hydrostatic core or a subsurface ocean, and the phase of the libration is more consistent with an ocean. Either interpretation implies that Mimas is differentiated, challenging traditional models of its formation, evolution, and age. Determining whether Mimas has an ocean today will help constrain the possible histories of Mimas and its neighboring moons. Also, if Mimas were shown to have an ocean, it would represent a new class of small, "stealth" ocean worlds, whose surfaces do not betray the ocean's existence. I will describe the current state of knowledge about this curious moon, whether estimates of tidal heating support the presence of an ocean despite Mimas' high eccentricity, and how we might be able to use spacecraft measurements to determine whether Mimas is, indeed, an ocean moon today.

**Fact** | **Problem/New Discovery (title)** | **Support/Importance of Problem/New Discovery (specific to talk)** | **Overview of Talk** | **Future Outlook**

**LPL COLLOQUIUM** Tuesday, November 9 2021
**Dr. Tyler D. Robinson**
Northern Arizona University

<u>Towards New Worlds: Exploring Exoplanets with Next-Generation Missions</u>

Thousands of exoplanets have been discovered to date, many with sizes or masses unencountered in our Solar System. Excitingly, we are entering into an era where a diversity of observational resources will be able to tell us what these distant worlds are like. Amongst such endeavors, exoplanet direct imaging presents a critical and well-understood path towards exploring worlds that may even be Earth-like. The development of direct imaging mission concepts is an exciting step forward for the field of exoplanet science, and this presentation will cover the science that would come from such a mission in the areas of planetary studies, habitability, and life detection.

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|---|---|---|---|---|

Talk doesn't have to include a "Problem" per say

LPL Colloquium Thursday, December 2, 2021

**Dr. Sukrit Ranjan**
Northwestern University

**Theoretical Underpinnings of the Search for Life on Exoplanets**

We are on the cusp of a revolution in our understanding of life in the universe. Exoplanet surveys like *Kepler* have revealed potentially habitable planets to be common, and upcoming facilities like the *James Webb Space Telescope* and the *Thirty Meter Telescope* will at last have the ability to characterize their atmospheres in search of signs of life. However, proceeding from the astrophysical observables to inferences regarding the presence or absence of life will require considerable theoretical intervention. In this talk, I will illustrate the theoretical infrastructure that must be developed to prepare for exoplanet life search with three vignettes. Specifically, I will discuss (1) the UV environment on planets orbiting M-dwarfs and the implications for their inhabitability, (2) the photochemistry of water vapor and the implications for oxygen as a biosignature gas on planets orbiting Sun-like stars, and (3) efforts to increase the catalog of potential remote biomarkers of life, with a focus on reactive gases like phosphine. I will conclude by reviewing the considerable theoretical and laboratory work that remains to be done to prepare for the era of habitable planet characterization.

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In Class Exercise : Re-write the Abstract !

LPL COLLOQUIUM Tuesday, November 16

**Toward Testable Theories of Terrestrial Planet Evolution to Enable Exoplanet Life Detection**

**Dr. Joshua Krissansen-Totton** (NASA Hubble Fellowship Program)
University of California, Santa Cruz

Rocky planet evolution is sculpted by complex geophysical, geochemical, and astrophysical processes. Interpreting upcoming observations of terrestrial exoplanets will require an improved understanding of how these competing influences interact on long timescales. In particular, the interpretation of potential biosignature gases is contingent upon understanding the probable geochemical evolution of lifeless worlds. Here, I present a generalized model of rocky planet evolution that connects early magma ocean evolution to subsequent, temperate geochemical cycling. The thermal evolution of the interior, tectonic recycling of volatiles, surface climate, and atmospheric escape are explicitly coupled throughout this evolution. The model can reproduce the atmospheric evolution of a lifeless Earth; it consistently predicts an anoxic atmosphere and temperate surface conditions after 4.5 Gyrs of evolution. However, if initial volatile inventories are permitted to vary outside these "Earth-like" ranges, then dramatically different evolutionary trajectories are permitted, including scenarios whereby Earth-sized planets in the habitable zones of G-type stars accumulate oxygen rich atmospheres in the absence of life. The model also sheds light on the atmospheric evolution of Venus and Venus-like exoplanets; it can successfully recover modern Venus's atmosphere composition and thermal state. Moreover, there is a clear dichotomy in the evolutionary scenarios that recover modern Venus conditions, one in which Venus was never habitable and perpetually in runaway greenhouse since formation, and another where Venus experienced ~1-2 Gyr of surface habitability. Upcoming observations of terrestrial exoplanets such as the Trappist-1 system, GJ 1132b, LHS 3844b, and LHS 1140b (many of which are highly irradiated Venus-analogs) will provide valuable opportunities to test and improve such generalized models. I will argue that an understanding of terrestrial planets—both solar system and extra solar—as a unified class of objects will be necessary to enable exoplanet life detection.

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# Rewrite: LPL Abstract

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