MARK IVAN UGALINO

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EDUCATION

University of Maryland, College Park — Fall 2023 – *present*
Doctor of Philosophy in Astronomy
Department of Astronomy

University of Massachusetts, Dartmouth — 2021 – 2023
Master of Science in Physics
College of Engineering

University of the Philippines, Diliman — 2018 – 2020
Master of Science in Physics
National Institute of Physics

University of the Philippines, Diliman — 2013 – 2018
Bachelor of Science in Physics
National Institute of Physics

Quezon City Science High School — 2009 – 2013
High school diploma

SKILLS

Computer Languages	Python, Fortran, C/C++ *knowledgeable* in Julia and R
Software & Tools	ART (C, Kravstov et al), RAMSES (Fortran, Teyssier), FLASH (Fortran, Fryxell et al), MESA (Fortran, Paxton et al), yt (Python, Turk et al), SuperNu (Fortran, van Rossum, Wollaeger), Torch (Fortran, Timmes)
HPC Systems	TACC Stampede2, UMassD CARNIE, UMD Zaratan

GRANTS AND RECOGNITIONS

2023 NASA FINESST Research Grant (USD 148,826.00) — *declined*
Among first 27 selected for award out of 262 submitted proposals (10.3% award rate)

Graduate Dean's Fellowship (USD 10,000.00) — Fall 2023
Department of Astronomy, University of Maryland College Park

Chancellor's Centennial Engineering Scholarship — Spring 2023
University of Massachusetts Dartmouth

Graduate Research Award — April 27, 2022
Department of Physics, University of Massachusetts Dartmouth

FIP Distinguished Student Award — February 2022
American Physical Society

Gawad Direktor para sa Natatanging Bagong Guro — December 7, 2018
National Institute of Physics, UP Diliman

· The award was given in recognition of the exemplary performance of a newly hired junior faculty of the institute.

Gawad Direktor para sa Natatanging Discussion Teacher — December 7, 2018
National Institute of Physics, UP Diliman

· This award is given in recognition of the exemplary performance of a junior faculty member as a discussion teacher for lecture classes offered by the institute.

PUBLICATIONS

Using ^{44}Ti Emission to Differentiate Between Thermonuclear Supernova Progenitors
D Kosakowski, MI Ugalino, R Fisher, O Graur, A Bobrick, HB Perets (2022) (*accepted to MNRAS Letters*)

Steady-state density perturbations induced by a point mass in a finite cylinder.
MI Ugalino, I Vega (2020) Proceedings of the 38^{th} Samahang Pisika ng Pilipinas Physics Congress

Density perturbations in a collisional fluid induced by a particle on a slightly-eccentric orbit.
MI Ugalino, I Vega (2018) Proceedings of the 36^{th} Samahang Pisika ng Pilipinas Physics Congress

RESEARCH PROJECTS

Second year project: ***Magnetic field amplification in Milky Way–type galaxies*** (PI: Benedikt Diemer)

- We explore how magnetic fields grow in Milky-Way–type galaxies and investigate its effects on stellar formation, galaxy morphology and cosmic ray transport. We perform this through large-scale isolated galaxy simulations with ART (Kravtsov et al) and RAMSES (Teyssier et al).

Masteral thesis: ***Turbulently-driven deflagration-to-detonation transtion in near-M_{Ch} white dwarfs*** (PI: Robert Fisher)
**Awarded with Graduate Research Award*

- We apply *for the first time* a first-principles laboratory-validated turbulently driven explosion mechanism to three-dimensional simulations of near-Chandrasekhar mass white dwarfs using the multi-physics hydrodynamics code FLASH. We aim to connect our hydrodynamical models to diverse photometric and spectroscopic properties of observed type Ia supernovae by calculating nucleosynthetic yields using Torch (Timmes) and generating synthetic spectra using SuperNu (van Rossum, Wollaeger).

Observable signatures from helium ignited white dwarfs (PI: Robert Fisher)

- We use the late-time light curve powered by the radioactive decay of Ti-44 from helium-ignited white dwarfs to determine the progenitor system that produced observed normal and Ca-rich type Ia supernovae.

Long-term evolution of double degenerate white dwarf mergers (PI: Robert Fisher)

- We investigate the evolution of post-merger remnants from double degenerate binary systems using viscous alpha-disk and fully MHD models in two-dimensional FLASH simulations.

Masteral thesis: ***Dynamical friction effects on circular orbits immersed in a finite gaseous background*** (PI: Ian Vega)

- We proposed a solution to the dynamical friction problem in a finite cylindrical domain as an extension to the straight-line formulation of Vicente et al in slab geometries (2019), the motivation of which is the formation and evolution of giant planets.

Undergraduate thesis: ***Density perturbation induced by relativistic bodies in slightly-eccentric orbits*** (PI: Ian Vega)
**Nominated for outstanding BS Physics undergraduate thesis*

- We used a linear perturbation analysis to extend the relativistic formulation of dynamical friction to the slightly eccentric orbit case, that is motivated by the increasing interest on extreme-mass-ratio inspirals as gravitational wave sources.

SCHOOLS ATTENDED

Burgers Program Summer School on Turbulence June 3–7, 2024
University of Maryland Burgers Program for Fluid Dynamics

LANL Co-Design Summer School May–August 2023
Los Alamos National Laboratory, NM, U.S.A.

MESA Summer School August 8-12, 2022
University of California Santa Barbara, CA, U.S.A

NSF/APS-DPP GPAP Summer school on plasma physics for astrophysicists June 7-11, 2021
Swarthmore College (on-line)

Deciphering Dark Matter: From Galaxies to the Universe September 14–25, 2020
Institut Teknologi Bandung, Bandung, West Java, Indonesia (on-line)

TALKS AND POSTERS

Physics Speaks: It's turtles all the way down: lessons we can derive from cosmology 2023
Ateneo LeaPs invited talk

Ares – Simulating Type Ia Supernovae on Heterogeneous HPC Architectures (*poster*)
November 12-17, 2023
Supercomputing 2023, Denver, CO, U.S.A.

Turbulently-driven deflagration-to-detonation transition in near-Chandrasekhar mass white dwarfs (*invited talk*) June 15, 2023
Center for Theoretical Astrophysics, Los Alamos National Laboratory

Turbulently-driven deflagration-to-detonation transition in near-Chandrasekhar mass white dwarfs (*iPoster*) June 7, 2023
American Astronomical Society Meeting 242, Albuquerque, NM, U.S.A.

Three-dimensional simulations of turbulently-driven deflagration-to-detonation transition in near-Chandrasekhar type Ia supernovae (*contributed talk*) August 15-19, 2022
EuroWD22, Eberhard Karls Universität Tübingen, Tübingen, Germany

Turbulently-driven deflagration-to-detonation transition in near-Chandrasekhar mass white dwarfs (*contributed talk*) April 12, 2022
American Physical Society, New York City, NY, U.S.A.

Turbulently-driven deflagration to detonation transition in near-Chandrasekhar mass white dwarfs (*invited talk*) January 31, 2022
Massachusetts Institute of Technology, MA, U.S.A.

Late-time dynamical friction in finite disks (*invited talk*) February 4, 2021
University of Massachusetts Dartmouth, MA, U.S.A.

Steady-state density perturbations induced by a point mass in a finite cylinder (*contributed talk*) October 19, 2020
38^{th} Samahang Pisika ng Pilipinas Physics Conference, Philippines

PROFESSIONAL EXPERIENCE AND SERVICE TO THE FIELD

Graduate Research Assistant January 2024 – present
Department of Astronomy, University of Maryland College Park

Graduate Teaching Assistant August – December 2023
Department of Astronomy, University of Maryland College Park

Graduate Student Intern June 2023 – August 2023
Los Alamos National Laboratory

· *see* LANL Co-Design Summer School, http://lanl.github.io/cdss/

Graduate Teaching Fellow September 2022 – May 2023
Department of Physics, UMass Dartmouth

· Taught and created course materials for Physics 151 - Introduction to Astronomy

Graduate Research Assistant May 2021 – August 2022
Department of Physics, UMass Dartmouth

Graduate Teaching Assistant January 2021 – May 2021
Department of Physics, UMass Dartmouth

· Taught online recitation and laboratory courses in Classical Mechanics

Instructor 1 August 2018 – December 2020
National Institute of Physics, UP Diliman

· Taught in-person and online lectures and laboratory classes in Classical Mechanics, Electromagnetism, Physical Electronics, and Computational Physics

Reviewer (theoretical physics) 2019 – 2023
Proceedings of the Samahang Pisika ng Pilipinas Physics Conference

University of the Philippines Astronomical Society 2015 – present
Associate Member, Education and Research Coordinator (2017)

PROFESSIONAL REFERENCES

Prof. Benedikt Diemer
Adviser (PhD) and Assistant Professor of Astronomy
`diemer (at) umd (dot) edu`
Department of Astronomy, UMaryland College Park

Prof. Robert Fisher
Adviser (MSc) and Professor of Physics
`robert.fisher (at) umassd (dot) edu`
Department of Physics, UMass Dartmouth

Prof. Ian Vega
Adviser (BS and MS) and Professor of Physics
`ivega (at) nip (dot) upd (dot) edu (dot) ph`
National Institute of Physics, UP Diliman

Prof. Bo Dong
Associate Professor of Mathematics
`bdong (at) umassd (dot) edu`
Department of Mathematics, UMass Dartmouth

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