

# SungWon Kwak

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<https://swkwak.github.io/>

## [ Education ]

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**Ph.D.** in Astronomy at the **University of Rome**, joint by Sapienza and Tor Vergata 11/2019-03/2023

Thesis: The Formation and the Chemodynamical Evolution of the Milky Way  
and its Stellar Halo

Advisor: Prof. Giuseppe Bono

**M.S.** in Astronomy at **Seoul National University** 2014-2016

Thesis: Origin of Non-Axisymmetric Features of dE galaxies in the Virgo Cluster

Advisor: Prof. Woong-Tae Kim

**B.S.** in Physics & Astronomy at the **University of Washington**, Seattle 2009-2013

The Storm King High School, New York 2007-2009

## [ Ongoing Projects ]

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- **Stellar Halo**: Study the density distribution and the chemodynamical properties of old stellar Halo by comparing the observed RR Lyrae variables and the Auriga simulations and suggest a possible formation scenario of the Milky Way and M31.

- **Matal-rich RR Lyrae** : Study the chemodynamical properties of infalling progenitors in time evolution to understand the origin of the observed RRLs with disk dynamics.

- **Bulge/Disk**: Study bars, bulges, and disks in the Auriga simulations to understand three different gradients in the radial metallicity profiles of late-type galaxies found in observations.

- **Dark Matter Halo**: Find connection among bulge, stellar halo, and dark matter halo to conjecture the properties of the dark matter halo of the Milky Way.

## [ Experience ]

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- Research Assistant at Seoul National University Summer 2019

Project: *Effects of Cluster-Group Merger on Bar Formation and Star Formation Rate of Infalling Disk Galaxies* (Prof. Woong-Tae Kim)

- Mandatory Military Service at Korea Astronomy and Space Science Institute 2016-2019

- Internship at CERN (University of Michigan-CERN Research Abroad Program) Winter 2014

## [ References ]

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Prof. Giuseppe Bono, University of Rome Tor Vergata, Italy [bono@roma2.infn.it](mailto:bono@roma2.infn.it)

Prof. Federico Marinacci, University of Bologna, Italy [federico.marinacci2@unibo.it](mailto:federico.marinacci2@unibo.it)

Dr. Robert Grand, Liverpool John Moores University, UK [R.J.Grand@ljmu.ac.uk](mailto:R.J.Grand@ljmu.ac.uk)

## [ Scholarships ]

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- PhD Fellowship for the AASS program in Rome 2019-2022

- Kim In Ha Scholarship 2015-2016

- Brain Korea 21 Scholarship 2014-2016

- Erasmus Mundus Scholarship for 2 years, Category A (offered) 2014-2016

- Scholarship for the CERN internship by Richard Lounsbery Foundation

Winter 2014

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### [ Undergraduate Research Experience ]

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- SPH Simulation: the Stability of Protoplanetary Disks (Prof. Thomas Quinn) 2013
- Finding Superimposed High Redshift Spectra Using AstroML (Dr. Jake Vanderplas) 2013
- ATLAS-CERN Inner Tracker Upgrade (Prof. Shih-Chieh Hsu) 2013
- Radio Astronomy: (1) Estimating the Moon's temperature (2) Hydrogen distribution of the Galactic Plane (3) Continuum map of the Galactic Plan (Prof. Woodruff Sullivan) 2012-2013

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### [ Programming Experience ]

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Numerical Simulations and/or Output Analysis: *ChaNGa*, *GIZMO*, *Gadget2*, and *AREPO*

Data Analysis: *Python (Pynbody)*

Astronomical Image Analysis using *IRAF*

Engineering Modeling using *Solidworks*

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### [ Publications ]

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(9) *The Formation and the Chemodynamical Evolution of the Stellar Haloes in the Auriga Simulations*

**Kwak** et al. (in prep.)

(8) *Understanding the Origin of Metal-rich RR Lyrae with Disk Dynamics through the Auriga Simulations*

**Kwak** et al. (in prep.)

(7) *The Shape of the Galactic Halo up to 150 kpc through RR Lyrae and the Auriga Simulations*

**Kwak, SungWon**; Grand, Robert J. J.; Bono, Giuseppe; Braga, Vittorio F.; Marinacci, Federico; Monachesi, Antonela; Gómez, Facundo A.; Dall'Ora, Massimo; Fabrizio, Michele; Ferraro, Ivan; Fiorentino, Giuliana; Iannicola, Giacinto; Marrese, Paola M.; Marinoni, Silvia; Monelli, Matteo (submitted)

(6) *On the Use of Field, RR Lyrae as Galactic Probes. VII. Mixed mode RR Lyrae variables in Fornax and in nearby dwarf galaxies*

Braga, V. F., **et al.**, MNRAS, 517, 5368B (2022)

(5) *On the Use of Field RR Lyrae as Galactic Probes. V. Optical and Radial Velocity Curve Templates*

Braga, V. F., **et al.**, APJ, 919, 85B (2021)

(4) *Origin of Non-axisymmetric Features of Virgo Cluster Early-type Dwarf Galaxies – II. Tidal Effects on Disk Features and Stability*

**Kwak, SungWon**; Kim, Woong-Tae; Rey, Soo-Chang; & Quinn, Thomas R., ApJ, 887, 139K (2019)

(3) *The Geometric Albedo of (4179) Toutatis Estimated from KMTNet DEEP-South Observation*

Bach, Yoonsoo P., **et al.**, JKAS, 52, 71B (2019)

(2) *Effects of Gas on Formation and Evolution of Stellar Bars and Gaseous Nuclear Rings in Disk Galaxies*

Seo, Woo-Young; Kim, Woong-Tae; **Kwak, SungWon**; Hsieh, Pei-Ying; Han, Cheongho; & Hopkins, Phil F., ApJ, 872, 5 (2019)

(1) *Origin of Non-axisymmetric Features of Virgo Cluster Early-type Dwarf Galaxies – I. Bar Formation and Recurrent Buckling*

**Kwak, SungWon**; Kim, Woong-Tae; Rey, Soo-Chang; & Kim, Suk, ApJ, 839, 24 (2017)

**[ Talk/Poster ]**

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Poster: *Formation of Bar and Spirals of Infalling Dwarf Galaxies in Clusters*

Kwak, SungWon; Kim, Woong-Tae; Rey, Soo-Chang; & Quinn, Thomas

@ The 8th KIAS Workshop on Cosmology and Structure Formation in 2018 (Seoul, Korea)

E-Poster: *Are Disky Dwarf Galaxies Unstable to Formation of Bars and Spirals?*

Kwak, SungWon; Kim, Woong-Tae

@ 334th IAU Meeting 2018 (Vienna, Austria)

Talk: *Bar Formation and Recurrent Buckling Instability*

Kwak, SungWon

@ Korean Numerical Astrophysics Meeting in Sept. 2017 (Daejeon, Korea)

Talk: *Non-axisymmetric Features of Dwarf Elliptical Galaxies*

Kwak, SungWon; Kim, Woong-Tae; Rey, Soo-Chang; & Kim, Suk

@ id:GC-24, Korean Astronomical Society Meeting 2016 (Busan, Korea)

Talk: *Origin of Non-axisymmetric Features of dEs in the Virgo Cluster*

Kwak, SungWon; Kim, Woong-Tae; Rey, Soo-Chang; & Kim, Suk

@ id:202.08, 228th AAS Meeting 2016 (San Diego, CA, USA)