

# SUNGWON KWAK

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## EDUCATION

<b>Ph.D.</b> in Astronomy at the <b>University of Rome</b> , joint by Sapienza and Tor Vergata	2019 – 2023
Thesis: The Formation and the Chemodynamical Evolution of the Milky Way and its Stellar Halo	
Supervisor: Prof. Giuseppe Bono	
<b>M.S.</b> in Astronomy at <b>Seoul National University</b>	2009 – 2013
Thesis: Origin of Non-Axisymmetric Features of dE galaxies in the Virgo Cluster	
Supervisor: Prof. Woong-Tae Kim	
<b>B.S.</b> in Physics & Astronomy at the <b>University of Washington</b> , Seattle	2009 – 2013
Protoplanetary Disk Simulation (Prof. Thomas Quinn)	
Radio Astronomy (Prof. Woodruff Sullivan)	
ATLAS-CERN Inner Tracker Upgrade (Prof. Shih-Chieh Hsu)	
AstroML: Machine Learning and Data Mining (Dr. Jake Vanderplas)	
The Storm King High School, New York	2007 – 2009

## EMPLOYMENT

<b>Postdoc</b> at the Leibniz Institute for Astrophysics Potsdam (AIP)	2023.09 – <i>present</i>
<b>Postdoc</b> at Seoul National University (Prof. Woong-Tae Kim)	Summer 2023
Research Assistant at Seoul National University (Prof. Woong-Tae Kim)	Summer 2019
Technical Personnel (military service) at Korea Astronomy and Space Science Institute	2016 – 2019
Research Assistant at CERN, Switzerland	Winter 2014

## PROJECTS/COLLABORATIONS

<b>SMUGGLE-Ring:</b> Nuclear Ring & Bar Formation using Multiphase Hydrodynamics Model (SMUGGLE)	
N-body Simulation: Bar, Spirals, and Buckling Instability	
4-MOST Spectroscopic Survey: S3-Milky Way Bulge and Disk Low Resolution Survey	
Auriga SuperStars: Cosmological Zoom-in Simulations of the Milky Way-like Galaxies	

## RESEARCH INTEREST

Galactic Dynamics, Bar, Spirals, Nuclear Ring, Disk Instabilities	
Galaxy Formation, Stellar Halo, Dark Matter Halo, Galaxy Cluster	

## GRANTS/SCHOLARSHIPS

<b>Computing Grant</b> at NHR@ZIB in Germany (Co-PI & Project Manager, <b>17.08M core hours</b> )	2026
<i>The Galactic Hearts Chronicle: Chemodynamical Archives of Galaxy Evolution Histories in Nuclear Rings</i>	
<b>PhD Fellowship</b> for the AASS program in Rome	2019 – 2022
<b>Kim In Ha Scholarship</b> at Seoul National University	2015 – 2016
<b>Brain Korea 21 Scholarship</b> at Seoul National University	2014 – 2016
<b>AstroMundus Scholarship</b> (offered: 45,000 EUR/2 yr)	2014 – 2016
<b>UM-CERN Internship Program</b> by Richard Lounsbery Foundation (10,000 USD/3 months)	Winter 2014

## PROGRAMMING

<b>Simulation Software</b>	CHANGA, GIZMO, GADGET, and AREPO Pynbody (Python), IRAF, Solidworks
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## PUBLICATION

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- (9) **Kwak, SungWon**; Minchev, Ivan; Steinmetz, Matthias; Yi, Sukyoung K. “*Effects of Resolution and Local Stability on Galactic Disks: 2. Halo Resolution and Softening on Bar Formation*” (In prep.)
- (8) **Kwak, SungWon**; Minchev, Ivan; Pfrommer, Christoph; Steinmetz, Matthias; Yi, Sukyoung K. “*Effects of Resolution and Local Stability on Galactic Disks: I. Multiple Spiral Mode Formation via Swing Amplification*” (Submitted to A&A)
- (7) Fiorentino, G. et al. including **Kwak, SungWon** “*On the early formation of the Galactic halo traced by RR Lyrae stars*” 2022MmSAI, 93d, 47F
- (6) Braga, V. F. et al. including **Kwak, SungWon** “*On the use of field RR Lyrae as galactic probes - VI. Mixed mode RR Lyrae variables in Fornax and in nearby dwarf galaxies*” 2022MNRAS, 517, 5368B
- (5) Braga, V. F. et al. including **Kwak, SungWon** “*On the Use of Field RR Lyrae as Galactic Probes. V. Optical and Radial Velocity Curve Templates*” 2021ApJ, 919, 85B
- (4) Bach, Yoonsoo P. et al. including **Kwak, SungWon** “*The Geometric Albedo of (4179) Toutatis Estimated from KMTNet DEEP-South Observations*” 2019JKAS, 52, 71B
- (3) **Kwak, SungWon**; Kim, Woong-Tae; Rey, Soo-Chang; Quinn, Thomas R. “*Origin of Nonaxisymmetric Features of Virgo Cluster Early-type Dwarf Galaxies. II. Tidal Effects on Disk Features and Stability*” 2019ApJ, 887, 139K
- (2) Seo, Woo-Young; Kim, Woong-Tae; **Kwak, SungWon**; Hsieh, Pei-Ying; Han, Cheongho; Hopkins, Phil F. “*Effects of Gas on Formation and Evolution of Stellar Bars and Nuclear Rings in Disk Galaxies*” 2019ApJ, 872, 5S
- (1) **Kwak, SungWon**; Kim, Woong-Tae; Rey, Soo-Chang; Kim, Suk “*Origin of Non-axisymmetric Features of Virgo Cluster Early-type Dwarf Galaxies. I. Bar Formation and Recurrent Buckling*” 2017ApJ, 839, 24K

## TALK/POSTER

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- Talk:* **Kwak, SungWon** “*The Effects of Resolution and Disk Stability on the Multi-armed Spiral Formation*” 10th East Asia Numerical Astrophysics Meeting (EANAM 10), September 2025, Jeju, Korea
- Talk:* **Kwak, SungWon** “*Spirals, Bar, Bulge, and Nuclear Ring*” Auriga Collaboration Meeting 2024, Durham, UK
- Colloquium:* **Kwak, SungWon** “*Assembly History of the Ancient Halo and Disk in the Auriga Simulation*” Yonsei University, November 2024, Seoul, Korea
- Talk:* **Kwak, SungWon** “*Bar and Nuclear Ring Formation*” Auriga Collaboration Meeting 2024, Munich, Germany
- Talk:* **Kwak, SungWon** et al. “*Origin of Non-axisymmetric Features of dEs in the Virgo Cluster*” AAS Meeting #228, id.202.08, June 2016, San Diego, USA
- Talk:* **Kwak, SungWon** et al. “*Non-axisymmetric Features of Dwarf Elliptical Galaxies*” KAS Meeting 2016BKAS, 41Q, 39K
- Poster:* Yoachim, P. et al. including **Kwak, SungWon** “*Bulge Kinematics of Giant Low Surface Brightness Galaxies*” AAS Meeting #223, id.453.06
- Poster:* Schmitz, D. et al. including **Kwak, SungWon** “*IFU Observations of Giant Low Surface Brightness Galaxies*” AAS Meeting #223, id.453.05