Dr. Zhen Yuan 袁珍

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Education and Employment

Mar 2021 – present	**Postdoc**, Observatoire Astronomique de Strasbourg, CNRS, France
Dec 2017 – Aug 2020	**LAMOST Fellow**, Shanghai Astronomical Observatory, China
Oct 2015 – Oct 2017	**Postdoc**, Shanghai Jiao Tong University, China
Sep 2009 – Sep 2015	**PhD**, University of Minnesota, USA
	Supervisor: Professor Yong-Zhong Qian
Sep 2005 – Jun 2009	**BS**, Physics, Nanjing University, China

Research Interests

Galactic Archaeology
- Developing state-of-the-art algorithms to search for streams and substructures in the stellar halo of the Milky Way in the *Gaia* era, using those to understand nucleosynthesis in ancient dwarf galaxies
- Detecting and characterizing dwarf galaxies in the Local Group with the *Chinese Space Station Telescope*, using them to probe the faint end of galaxy formation in a cosmological context

Deep Learning in Astronomy
- Developing Machine Learning tools tailored to various astronomic datasets with the aim of fully extracting the information from the observations to achieve tractable improvements from traditional approach

Publications and Presentations

- 9 first/corresponding author publications (2016 – 2022), 232 citations[†]
- China Top Cited Paper Award (2022), 95 citations
- 40 total publications including 1 Nature (2016 – 2022), 703 citations, h-index 16
- 2 invited conference talks, 2 colloquium talks, 4 seminar talks around the world

[†] total citations, see the publication and presentation lists for details

Data Science Experience and Projects

2022	Developed `PhotCalib`, a neural-network based **photometric survey calibrator** and applied to the *Pristine* survey data
	Developing `GNNPhot`, a graph-neural-network based method to derive stellar parameters from multi-band photometry
2017 – 2020	Developed `StarGO`, a **novel group identification** method based on self-organizing-maps, applicable to general clustering problems
	Applied `StarGO` to the *Gaia* dataset, discovered the tidal tails of Coma Berenices open cluster
	Applied `StarGO` to the LAMOST-*Gaia* dataset, discovered a series of **new very metal-poor substructures**, and a **new stellar stream**, named **LMS-1**
2016	Completed Introduction to Data Science in Python with certificate offered through Coursera
	Participated in the **Visualization Environmental Data Challenge** hosted by Alibaba cloud and entered the second round (top 50 out of 904 teams)

Observations and Proposals

Observing experience: 8 nights in person, 6 nights in remote mode on 2–8m telescopes (INT/IDS, VLT/UVES, Subaru/HDS, Magellan/MIKE)

Successful proposals: 10 proposals as PI or significantly contributing co-I. The series of proposals on high-resolution follow-up of substructures and streams:
- 38 hours with VLT/UVES (2020B, 2021B)
- 5.5 nights with Subaru/HDS (2019B, 2020B, 2021A, 2022B)
- 3 nights with Magellan/MIKE (2019B, 2022B)
- 20 hours with CFHT/ESPaDOnS (2020B, 2021A)

Teamwork and Experience

Team leader
- **HR-GO team**, leading a high-resolution spectroscopic analysis core team of 6 junior researchers around the world to systematically work on the spectra taken from different telescopes, since Apr 2021
- **Dwarf Galaxy Detection team**, leading a core team of 5 researchers and PhD students from different institutes to work on the project of dwarf galaxy detection with *CSST*, since 2020
- Astro Hack week team, Heidelberg, Oct 2022
- *Gaia*-LAMOST hackathon team, Shanghai, Nov 2018
- Visualization Environmental Data Challenge team, Sep 2016

Organisation
- Co-organizer of Astro-Coffee, Strasbourg Observatory, Sep 2021 – present
- Co-organizer of Machine Learning Club, Strasbourg Observatory, Oct 2021 — Mar 2022
- LOC member, Journ'Ies scientifiques "Galaxies" du PNCG, Strasbourg, France, Jun 2022
- LOC member, The Life and Times of the Milky Way, Shanghai, China, Nov 2018
- Co-organizer of Astro-NEWs, Shanghai Astronomical Observatory, 2018

Memberships
- Active member of the international *Pristine* collaboration, since 2020
- Active member of WEAVE Galactic Archaeology High-Resolution sub-survey and Low-Resolution Highlat sub-survey, since 2021
- Member of the 4MOST – S1 – Milky Way Halo Low-Resolution sub-survey, since 2021

Teaching and Supervision

- Co-supervision of Han Qu, PhD student at Purple Mountain Observatory (Mar 2021 – present)
- Teaching assistant courses: Introductory Physics for non-physics majors, Introduction to Particle and Nuclear Physics, Quantum Mechanics for physics undergraduates and graduates (Sep 2009 – Dec 2011)

Fundings

- Shanghai sailing funding for junior researchers (2019-2021)
- Postdoc general funding (2018-2020)
- LAMOST research funding (2018-2020)

Outreach

- Press Release (*Chinese*): The stellar structure with the lowest metallicity of the Universe, Mar 2022
- Public Talk: Mining Astronomical Data in the Machine Learning Era, Fudan University, Shanghai, Nov 2018

Presentations and Hackathons

17 selected international conference, seminar, and colloquium talks

2022

Astro Hack Week, Heidelberg, Germany, Oct 2022

Invited Physics colloquium talk – University of Groningen, Netherlands, Sep 2022

Contributed talk, "Very and extremely metal poor stellar streams - messengers from the early universe" – Satellite galaxies and tidal streams in the framework of cosmological models – EAS, Valencia, Spain, Jul 2022

Contributed talk – Journées scientifiques "Galaxies" du PNCG, Strasbourg, France, Jun 2022

Invited talk, "Very and extremely metal poor stellar streams - messengers from the early universe" – The Local Group in the Gaia era: from the Galactic halo to the Andromeda galaxy – Les Journées de la Société Française d'Astronomie & d'Astrophysique, Besançon, France, Jun 2022

2021 **Invited seminar talk**, Zhejiang University, China, Mar 2021

2020 **Invited Astronomy colloquium talk**, Strasbourg, France, Jun 2020

Contributed talk, "Dynamical Relics of the Ancient Galactic Halo" – First Stars VI, Concepci'şn, Chile, Mar 2020

2019 **Invited seminar talk**, Nanjing University, China, Oct 2019

Invited seminar talk, Yunnan University, China, Oct 2019

LAMOST-*Gaia* Sprint, Yichang, China, Oct 2019

Contributed talk – The Milky Way 2019: LAMOST and Other Surveys, Yichang, China, Oct 2019

Contributed talk, "Dynamical Relics with r-process Enhanced Signatures from Ancient Small Dwarf Galaxies" – CEMP Stars as Probes of First-Star Nucleosynthesis, the IMF, and Galactic Assembly, Geneva, Switzerland, Sep 2019

Contributed talk, "Relics from LAMOST DR3 Very Metal-Poor Stars – Linking to Early Nucleosynthesis in Ancient Dwarf Galaxies" – The Gaia Treasure Hunt, Workshop at IoA, Cambridge, UK, Sep 2019

Invited seminar talk, National Astronomical Observatories of China, Beijing, May 2019

Seminar talk, "Dynamical Relics with r-process Enhanced Signatures from Ancient Small Dwarf Galaxies" – KITP Program: Dynamical Models for Stars and Gas in Galaxies in the Gaia Era. Santa Barbara, US, Apr 2019

Gaia Sprint, Santa Barbara, US, Mar 2019

2018 LAMOST-*Gaia* Hackathon, Shanghai, China, Nov 2018

Contributed talk, "The Identification of the Northern Counterpart of the Cetus Polar Stream and Its Association with NGC 5824" – The Life and Times of the Milky Way, Shanghai, China, Nov 2018

LAMOST-*Gaia* Sprint, Beijing, China, Jun 2018

before 2016 Contributed talk, JINA-CEE Frontiers in Nuclear Astrophysics Meeting, Michigan State University, MI, US, Mar 2015

Invited talk, "Chemical Evolution Model of Fornax Dwarf Spheroidal Galaxy" – Program on Nucleosynthesis and Chemical Evolution: Recent Progress and Future Directions, Institute For Nuclear Theory, University of Washington, WA, US, Jul 2014

Publications list

15 major contribution papers (2016 – 2022)

Including 1 paper in referee, 6 papers have number of citing papers ≥ 20

2022 | Qu, H., **Yuan**, **Z.** , Doliva-Dolinsky, A., et al. 2022 "Local Group dwarf galaxy detection limit in the Chinese Space Station Telescope Survey", *accepted to MNRAS*

Martin, N. F., Ibata, R. A., Starkenburg, E., **Yuan**, **Z.** , et al. 2022 "The Pristine survey - XVI. The metallicity of 26 stellar streams around the Milky Way detected with the STREAMFINDER in Gaia EDR3," MNRAS, 516, 5331-5354, 15 citations

Ramos, P., Antoja, T., **Yuan**, **Z.** , et al. 2022 "The Sagittarius stream in Gaia Early Data Release 3 and the origin of the bifurcations," A&A, 666, A64, 8 citations

Yuan, **Z.** , Martin, N. F., Ibata, R. A., et al. 2022 "The Pristine survey - XVII. The C-19 stream is dynamically hot and more extended than previously thought," MNRAS, 514, 1664-1671, 3 citations

Yuan, **Z.** , Malhan, K., Sestito, F., et al. 2022 "The Complexity of the Cetus Stream Unveiled from the Fusion of STREAMFINDER and StarGO," ApJ, 930, 103, 15 citations

2021 | Malhan, K., **Yuan**, **Z.** , Ibata, R. A., et al. 2021 "Evidence of a Dwarf Galaxy Stream Populating the Inner Milky Way Halo," ApJ, 920, 51, 28 citations

2020 | Chang, J., **Yuan**, **Z.** , Xue, X.-X., et al. 2020 "Is NGC 5824 the Core of the Progenitor of the Cetus Stream?," ApJ, 905, 100, 15 citations

Banerjee, P., Wu, M.-R., **Yuan**, **Z.** , 2020 "Neutron Star Mergers as the Main Source of r-process: Natal Kicks and Inside-out Evolution to the Rescue," ApJL, 902, L34, 15 citations

Placco, V. M., Santucci, R. M., **Yuan**, **Z.** , et al. 2020 "The R-process Alliance: The Peculiar Chemical Abundance Pattern of RAVE J183013.5-455510," ApJ, 897, 78, 10 citations

Yuan, **Z.** , Chang, J., Beers, T. C., et al. 2020 "A Low-mass Stellar-debris Stream Associated with a Globular Cluster Pair in the Halo," ApJL, 898, L37, 50 citations

Yuan, **Z.** , Myeong, G. C., Beers, T. C., et al. 2020 "Dynamical Relics of the Ancient Galactic Halo," ApJ, 891, 39, 87 citations

2019 | **Yuan**, **Z.** , Smith, M. C., Xue, X.-X., et al. 2019 "Revealing the Complicated Story of the Cetus Stream with StarGO," ApJ, 881, 164, 21 citations

Tang, S.-Y., Pang, X., **Yuan**, **Z.** , et al. 2019 "Discovery of Tidal Tails in Disrupting Open Clusters: Coma Berenices and a Neighbor Stellar Group," ApJ, 877, 12, 64 citations

2018 | **Yuan**, **Z.** , Chang, J., Banerjee, P., et al. 2018 "StarGO: A New Method to Identify the Galactic Origins of Halo Stars," ApJ, 863, 26, 32 citations

2016 | **Yuan**, **Z.** , Qian, Y.-Z., Jing, Y. P. 2016 "Estimating the evolution of gas in the Fornax dwarf spheroidal galaxy from its star formation history: an illustrative example," MNRAS, 456, 3253-3264, 3 citations

24 co-authored papers of the full publication list (2017 – 2022)

2022 | Longeard, N., Jablonka, P., Arentsen, A., et al. 2022 "The Pristine dwarf galaxy survey - IV. Probing the outskirts of the dwarf galaxy Bo'ütes I," MNRAS, 516, 2348-2362

Vitali, S., Arentsen, A., Starkenburg, E., et al. 2022 "The Pristine Inner Galaxy Survey (PIGS) IV: A photometric metallicity analysis of the Sagittarius dwarf spheroidal galaxy," MNRAS.tmp,

Matsuno, T., Dodd, E., Koppelman, H. H., et al. 2022 "High-precision chemical abundances of Galactic building blocks. II. Revisiting the chemical distinctness of the Helmi streams," A&A, 665, A46

Oria, P.-A., Tenachi, W., Ibata, R., et al. 2022 "Antaeus: A Retrograde Group of Tidal Debris in the Milky Way's Disk Plane," ApJL, 936, L3

Errani, R., Navarro, J. F., Ibata, R., et al. 2022 "The Pristine survey - XVIII. C-19: tidal debris of a dark matter-dominated globular cluster?," MNRAS, 514, 3532-3540

Tenachi, W., Oria, P.-A., Ibata, R., et al. 2022 "Typhon: A Polar Stream from the Outer Halo Raining through the Solar Neighborhood," ApJL, 935, L22

Sestito, F., Venn, K. A., Arentsen, A., et al. 2022 "The Pristine Inner Galaxy Survey (PIGS) V: a chemo-dynamical investigation of the early assembly of the Milky Way with the most metal-poor stars in the bulge," arXiv, arXiv:2208.13791

Li, Q.-Z., Huang, Y., Dong, X.-B., et al. 2022 "On the origins of Hypervelocity stars as revealed by large-scale Galactic surveys," arXiv, arXiv:2207.04406

Doliva-Dolinsky, A., Martin, N. F., Thomas, G. F., et al. 2022 "The PAndAS View of the Andromeda Satellite System. III. Dwarf Galaxy Detection Limits," ApJ, 933, 135

Matsuno, T., Koppelman, H. H., Helmi, A., et al. 2022 "High-precision chemical abundances of Galactic building blocks. The distinct chemical abundance sequence of Sequoia," A&A, 661, A103

Lucchesi, R., Lardo, C., Jablonka, P., et al. 2022 "The Pristine survey - XV. A CFHT ESPaDOnS view on the Milky Way halo and disc populations," MNRAS, 511, 1004-1021

Malhan, K., Ibata, R. A., Sharma, S., et al. 2022 "The Global Dynamical Atlas of the Milky Way Mergers: Constraints from Gaia EDR3-based Orbits of Globular Clusters, Stellar Streams, and Satellite Galaxies," ApJ, 926, 107

Shank, D., Beers, T. C., Placco, V. M., et al. 2022 "Dynamically Tagged Groups of Metal-poor Stars from the Best and Brightest Survey," ApJ, 926, 26

Martin, N. F., Venn, K. A., Aguado, D. S., et al. 2022 "A stellar stream remnant of a globular cluster below the metallicity floor," Nature, 601, 45-48

2021 | Pang, X., Yu, Z., Tang, S.-Y., et al. 2021 "Disruption of Hierarchical Clustering in the Vela OB2 Complex and the Cluster Pair Collinder 135 and UBC 7 with Gaia EDR3: Evidence of Supernova Quenching," ApJ, 923, 20

Longeard, N., Jablonka, P., Arentsen, A., et al. 2021 "The Pristine Dwarf-Galaxy survey – IV. Probing the outskirts of the dwarf galaxy Bo'ütes I," arXiv, arXiv:2107.10849

Gudin, D., Shank, D., Beers, T. C., et al. 2021 "The R-Process Alliance: Chemodynamically Tagged Groups of Halo r-process-enhanced Stars Reveal a Shared Chemical-evolution History," ApJ, 908, 79

Aguado, D. S., Myeong, G. C., Belokurov, V., et al. 2021 "The S2 stream: the shreds of a primitive dwarf galaxy," MNRAS, 500, 889-910

Publications list

2019 — Herczeg, G. J., Kuhn, M. A., Zhou, X., et al. 2019 "An Initial Overview of the Extent and Structure of Recent Star Formation within the Serpens Molecular Cloud Using Gaia Data Release 2," ApJ, 878, 111

Zheng, Z., Li, C., Mao, S., et al. 2019 "SDSS-IV MaNGA: Environmental Dependence of the Mgb/<Fe>-σ_*Relation for Nearby Galaxies," ApJ, 873, 63

2017 — Li, Z.-Z., Jing, Y. P., Qian, Y.-Z., et al. 2017 "Determination of Dark Matter Halo Mass from Dynamics of Satellite Galaxies," ApJ, 850, 116