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Research

My field of research is stellar spectroscopy. My main project deals with the origin of the galactic bulge and the chemical description of the Galactic Center and its connection to the inner 3 degrees of the bulge. The methodology I am using to achieve this goal is the investigation of giant stars in the bulge at high spectral resolution in the near-IR. A red thread through my research projects have been spectroscopy at high resolution with special emphasis on the opportunities that come with cutting-edge IR spectrometers and the development of methodologies for this new research field. See also www.astro.lu.se/~ryde

Qualifications

engineering physics, MSc , Departments at LTH

Employment

Office director, Professor

Astrophysics
Lund University
Lund, Sweden
2022 Dec 23 → present

Member of Strategic Research Area

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Research outputs

Chemical analysis of the Milky Way's nuclear star cluster: Evidence for a metallicity gradient

Schultheis, M., Serrano, L., Thorsbro, B., Nogueras-Lara, F., Feldmeier-Krause, A., Nandakumar, G., Fiteni, K., Sormani, M. C. & Ryde, N., 2026 Jan, In: Astronomy and Astrophysics. 705, A235.

Supergiant GCIRS 22 in the Milky Way nuclear star cluster: Revised alpha abundances

Thorsbro, B., Khalidy, S., Rich, R. M., Schultheis, M., Taniguchi, D., Amarsi, A. M., Kordopatis, G., Nandakumar, G., Nishiyama, S. & Ryde, N., 2025 Dec, In: Astronomy and Astrophysics. 704, A62.

Rubidium Abundances in Cool Giants from High-resolution H-band Spectra: A New Diagnostic for Galactic Chemical Evolution

Ryde, N., Kocher, J., Nandakumar, G., Hartman, H., Molero, M., Jönsson, H., Mace, G., Sawczynec, E. & Kaplan, K. F., 2025 Aug 1, In: *Astrophysical Journal*. 988, 2, 235.

Chemical abundances in the Milky Way's nuclear stellar disc

Ryde, N., Nandakumar, G., Albarracín, R., Schultheis, M., Rojas-Arriagada, A. & Zoccali, M., 2025 Jul 1, In: *Astronomy and Astrophysics*. 699, A176.

The First Chemical Census of the Milky Way's Nuclear Star Cluster

Nandakumar, G., Ryde, N., Schultheis, M., Rich, R. M., di Matteo, P., Thorsbro, B. & Mace, G., 2025 Mar, In: *Astrophysical Journal Letters*. 982, 1, L14.

Chemical Abundances in the Nuclear Star Cluster of the Milky Way: Alpha-element Trends and Their Similarities with the Inner Bulge

Ryde, N., Nandakumar, G., Schultheis, M., Kordopatis, G., Matteo, P. D., Haywood, M., Schödel, R., Nogueras-Lara, F., Rich, R. M., Thorsbro, B., Mace, G. N., Agertz, O., Amarsi, A. M., Kocher, J., Molero, M., Orglia, L., Pagnini, G. & Spitoni, E., 2025 Feb 1, In: *Astrophysical Journal*. 979, 2, 174.

Abundance ties: Nephela and the globular cluster population accreted with ω Cen: Based on APOGEE DR17 and Gaia EDR3

Pagnini, G., Di Matteo, P., Haywood, M., Mastrobuono-Battisti, A., Renaud, F., Mondelin, M., Agertz, O., Bianchini, P., Casamiquela, L., Khoperskov, S. & Ryde, N., 2025 Jan, In: *Astronomy and Astrophysics*. 693, A155.

Metallicity-dependent kinematics and orbits in the Milky Way's nuclear stellar disc

Nogueras-Lara, F., Nieuwmunster, N., Schultheis, M., Sormani, M. C., Fragkoudi, F., Thorsbro, B., Rich, R. M., Ryde, N., Sanders, J. L. & Smith, L. C., 2024 Oct 1, In: *Astronomy and Astrophysics*. 690, A313.

M giants with IGRINS: IV. Identification and characterisation of a NIR line of the s-element barium

Nandakumar, G., Ryde, N., Hartman, H. & Mace, G., 2024 Oct, In: *Astronomy and Astrophysics*. 690, A226.

M giants with IGRINS: III. Abundance trends for 21 elements in the solar neighborhood from high-resolution near-infrared spectra

Nandakumar, G., Ryde, N., Forsberg, R., Montelius, M., Mace, G., Jönsson, H. & Thorsbro, B., 2024 Apr 1, In: *Astronomy & Astrophysics*. 684, 23 p., A15.

Composition of Giants 1° North of the Galactic Center: Detailed Abundance Trends for 21 Elements Observed with IGRINS

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A Wide Metallicity Range for Gyr-old Stars in the Nuclear Star Cluster

Thorsbro, B., Forsberg, R., Kordopatis, G., Mastrobuono-Battisti, A., Church, R. P., Rich, R. M., Ryde, N., Schultheis, M. & Nishiyama, S., 2023 Nov 1, In: *Astrophysical Journal Letters*. 1, L18, L18.

M giants with IGRINS: II. Chemical evolution of fluorine at high metallicities

Nandakumar, G., Ryde, N. & Mace, G., 2023 Aug 1, In: *Astronomy and Astrophysics*. 676, 11 p., A79.

Detailed α abundance trends in the inner Galactic bulge

Nieuwmunster, N., Nandakumar, G., Spitoni, E., Ryde, N., Schultheis, M., Rich, R. M., Barklem, P. S., Agertz, O., Renaud, F. & Matteucci, F., 2023 Mar 1, In: *Astronomy and Astrophysics*. 671, A94.

First r-process enhanced star confirmed as a member of the Galactic bulge

Forsberg, R., Rich, R. M., Nieuwmunster, N., Jönsson, H., Schultheis, M., Ryde, N. & Thorsbro, B., 2023 Jan 1, In: *Astronomy and Astrophysics*. 669, A17.

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The Gaia-ESO Public Spectroscopic Survey: Implementation, data products, open cluster survey, science, and legacy

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Observing early stellar nucleosynthesis

Ryde, N. & Harper, G., 2021 Dec, In: *Nature Astronomy*. 5, 12, p. 1212-1213 2 p.

Age and helium content of the open cluster NGC 6791 from multiple eclipsing binary members: III. Constraints from a subgiant

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VINTERGATAN III: how to reset the metallicity of the Milky Way

Renaud, F., Agertz, O., Andersson, E., Read, J. I., Ryde, N., Bensby, T., Rey, M. P. & Feuillet, D., 2021, In: *Monthly Notices of the Royal Astronomical Society*. 503, 4

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Fluorine in the Solar Neighborhood: The Need for Several Cosmic Sources

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Sofia-exes observations of betelgeuse during the great dimming of 2019/2020

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Modelling the chemical evolution of Zr, La, Ce, and Eu in the Galactic discs and bulge

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ALMA and VLA reveal the lukewarm chromospheres of the nearby red supergiants Antares and Betelgeuse

O'Gorman, E., Harper, G. M., Ohnaka, K., Feeney-Johansson, A., Wilkeneit-Braun, K., Brown, A., Guinan, E. F., Lim, J., Richards, A. M. S., Ryde, N. & Vlemmings, W. H. T., 2020, In: Astronomy and Astrophysics. 638, A65.

Detailed Abundances in the Galactic Center: Evidence of a Metal-rich Alpha-enhanced Stellar Population

Thorsbro, B., Ryde, N., Rich, R. M., Schultheis, M., Renaud, F., Spitoni, E., Fritz, T. K., Mastrobuono-Battisti, A., Origlia, L., Matteucci, F. & Schödel, R., 2020, In: Astrophysical Journal. 894, 1, 26.

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Stellar population astrophysics (SPA) with the TNG: Identification of a sulphur line at $\lambda_{\text{air}} = 1063.6$ nm in GIANO-B stellar spectra

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Forsberg, R., Jönsson, H., Ryde, N. & Matteucci, F., 2019 Nov, In: Astronomy & Astrophysics. 631, 15 p., A113.

The inner two degrees of the Milky Way: Evidence of a chemical difference between the Galactic Center and the surrounding inner bulge stellar populations

Schultheis, M., Rich, R. M., Origlia, L., Ryde, N., Nandakumar, G., Thorsbro, B. & Neumayer, N., 2019 Jul, In: Astronomy and Astrophysics. 627, A152.

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4MOST Consortium Survey 4: Milky Way Disc and Bulge High-Resolution Survey (4MIDABLE-HR)

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Detailed abundances for the old population near the galactic center. I. Metallicity distribution of the nuclear star cluster

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Chemical abundances of 11 bulge stars from high-resolution, near-IR spectra

Ryde, N., Gustafsson, B., Edvardsson, B., Melendez, J., Alves-Brito, A., Asplund, M., Barbuy, B., Hill, V., Kaeufli, H. U., Minniti, D., Ortolani, S., Renzini, A. & Zoccali, M., 2010, In: *Astronomy & Astrophysics*. 509

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Ryde, N., Edvardsson, B., Gustafsson, B., Eriksson, K., Kaeufli, H. U., Siebenmorgen, R. & Smette, A., 2009, In: *Astronomy & Astrophysics*. 496, 3, p. 701-U141

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Harper, G. M., Carpenter, K. G., Ryde, N., Smith, N., Brown, J., Brown, A. & Hinkle, K. H., 2009, *AIP Conference Proceedings*. American Institute of Physics (AIP), Vol. 1094. p. 868-871

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Ryde, N., Edvardsson, B., Gustafsson, B. & Käufli, H.-U., 2007, *Proceedings of the International Astronomical Union*. Vazdekis, A. & Peletier, R. F. (eds.). Cambridge University Press, Vol. 241. p. 260-261

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Vintergatans bulb

Ryde, N., 2006, *Forskning och framsteg*, 2006, 8, p. 48-53.

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Ryde, N., Harper, G. M., Richter, M. J., Greathouse, T. & Lacy, J. H., 2006, In: *Astrophysical Journal*. 637, p. 1040-1055

Water Vapor on My Cep

Ryde, N., Richter, M. J., Harper, G. M., Eriksson, K. & Lambert, D. L., 2006, In: *Astrophysical Journal*. 645, p. 652-658

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Ryde, F., Kocevski, D., Bagoly, Z., Ryde, N. & Mészáros, A., 2005, In: *Astronomy and Astrophysics*. 432, p. 105-116

On the Origin of Sulfur

Ryde, N. & Lambert, D. L., 2005, *ASP Conference Proceedings*. Bash, F. & Barnes III, T. (eds.). Astronomical Society of the Pacific (ASP), Vol. 336. p. 355

Phoenix Spectra of Carbon Stars in the LMC

Wallin, R., Eriksson, K., Gustafsson, B., Hinkle, K. L., Lambert, D. L., Ryde, N. & Westerlund, B., 2005, *ESO Astrophysics Symposia*. Käufel, H. U., Siebenmorgen, R. & Moorwood, A. (eds.). Springer, p. 439

Sulphur abundances in metal-poor stars

Korn, A. & Ryde, N., 2005, In: *Astronomy and Astrophysics*. 443, p. 1029-1032

The Abundance of Elements in Cool Stars, as Determined from High-Resolution, 1-5 Micron Spectroscopy

Ryde, N., Gustafsson, B., Eriksson, K. & Wahlin, R., 2005, *ESO Astrophysics Symposia*. Käufel, H. U., Siebenmorgen, R. & Moorwood, A. (eds.). Springer, p. 365-376

Non-thermal emission of Mg I at 12 micron m from Procyon

Ryde, N. & Richter, M. J., 2004, In: *Astrophysical Journal Letters*. 611, p. L41-L43

On the galactic chemical evolution of sulfur

Ryde, N. & Lambert, D. L., 2004, In: *Astronomy and Astrophysics*. 415, p. 559-569

TEXES Observations of Betelgeuse: Dynamics and Thermodynamics of the Wind Acceleration Zone

Harper, G. M., Brown, A., Richter, M. J., Holmes, S. & Ryde, N., 2004, In: *Bulletin of the American Astronomical Society*. 36, p. 1425

The R Coronae Borealis stars: carbon abundances from forbidden C-lines

Pandey, G., Lambert, D. L., Rao, N. K., Gustafsson, B., Ryde, N. & Yong, D., 2004, In: *Monthly Notices of the Royal Astronomical Society*. 353, p. 143-152

The Zeeman-sensitive emission lines of Mg I at 12 micron m in Procyon
Ryde, N., Korn, A., Richter, M. J. & Ryde, F., 2004, In: *Astrophysical Journal*. 617, p. 551-558

What does the Unexpected Detection of Water Vapor in Arcturus' Atmosphere Tell us?
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Detection of Water Vapor in the Photosphere of Arcturus
Ryde, N., Lambert, D. L., Richter, M. J. & Lacy, J. H., 2002, In: *Astrophysical Journal*. 580, p. 447-458

Probing the mass-loss history of carbon stars using CO line emission
Schöier, F. L., Ryde, N. & Olofsson, H., 2002, In: *Astrophysical Journal*. 580, p. 447-458

The 3 micron m spectrum of R Doradus observed with the ISO-SWS
Ryde, N. & Eriksson, K., 2002, In: *Astronomy and Astrophysics*. 386, p. 874-883

Water in Arcturus' Atmosphere
Ryde, N., Lambert, D. L., Lacy, J. H. & Richter, M. J., 2002, In: *Bulletin of the American Astronomical Society*. 34, p. 779

Activities

Côte d'Azur Observatory

Ryde, N. (Visiting researcher)
2019 Jun 24 → 2019 Jul 20

The Galactic bulge in context of the MOSAIC spectrograph for the ELT

Ryde, N. (Invited speaker)
2019 Mar

'Abundance trends in the Bulge'

Ryde, N. (Speaker)
2019 Feb

'Abundance trends in the Bulge'

Ryde, N. (Speaker)
2019 Jan

'Detailed Abundances of Giants in the Inner Bulge and Galactic Centre'

Ryde, N. (Speaker)
2018 Dec

'The Milky Way's disks and bulge'

Ryde, N. (Keynote/plenary speaker)
2018 Nov

'Detailed Near-IR Stellar Abundances of Red Giants in the Galactic Cluster'

Ryde, N. (Speaker)
2018 Oct

Press release from Lund University

Ryde, N. (Role not specified)
2018 Oct → 2018 Dec

`Detailed near-IR stellar abundances of the Galactic Centre'

Ryde, N. (Role not specified)
2018 Jan

`Detailed Abundances of Giants in the Inner Bulge and Galactic Centre'

Ryde, N. (Keynote/plenary speaker)
2017 Jul

`Detailed near-IR stellar abundances of the Galactic Centre'

Ryde, N. (Speaker)
2017 Jan

`Infrared Stellar Spectroscopy and Analysis'

Ryde, N. (Invited speaker)
2015 Nov

`Detailed near-IR stellar abundances of the Galactic Centre'

Ryde, N. (Speaker)
2015 Jan

Vilka hemligheter ruvar Vintergatans centrum på?

Ryde, N. (Speaker)
2010 Mar 31

Prizes and Distinctions

Excellent Teacher Practitioner (ETP)

Ryde, N. (Recipient), 2012 Sept 21

Jury of Habilitation, Paris

Ryde, N. (Recipient), 2019 Mar

Ledamot Kungl. Fysiografiska Sällskapet

Ryde, N. (Recipient), 2021

Member of Sällskapet Lundaakademikerna

Ryde, N. (Recipient), 2010 Apr

Royal Swedish Academy of Sciences Research Fellow

Ryde, N. (Recipient), 2007 Sept 1

Awards

The Galactic Center as seen by MOONS

Ryde, N. (PI)
Swedish Research Council: SEK3,900,000.00
2024/01/01 → 2028/12/31

Projects

4MOST: 4MOST - massive spectroscopic surveys of the Milky Way and the Universe

Feltzing, S. (Researcher), Church, R. (Researcher), Hobbs, D. (Researcher), Bensby, T. (Researcher), Ryde, N. (Researcher), Hartman, H. (Researcher), Mcmillan, P. (Researcher), Jönsson, H. (Researcher), Agertz, O. (Researcher), Howes, L. (Researcher), Kushniruk, I. (Researcher), Agertz, O. (Researcher), Traven, G. (Researcher), Feuillet, D. (Researcher), Ernandes, H. (Researcher), Lehmann, C. (Researcher) & Plotnikova, A. (Researcher)

2011/01/01 → 2029/12/31

Carl-TryggerStiftelse: Water on Stars

Ryde, N. (PI) & Lambert, J. (Researcher)

2012/01/01 → 2013/12/31

Crafoordska stiftelsen: Post doc for Henrik Jönsson

Ryde, N. (Researcher)

eSSENCE@LU 11:3 - Systematic spectral clean-up for massively parallel surveys of stars

Church, R. (PI), Ryde, N. (Researcher), Korn, A. J. (Researcher), Lind, K. (Researcher) & Kordopatis, G. (Researcher)

2025/01/01 → 2026/12/31

Gaia-ESO Survey

Gilmore, G. (PI), Randich, S. (PI), Feltzing, S. (Col), Bensby, T. (Col), Howes, L. (Researcher), Gruyters, P. (Researcher),

Ryde, N. (Col), Stonkute, E. (Researcher) & Ruchti, G. (Researcher)

2012/12/24 → 2022/07/01

Kungl. Fysiografiska Sällskapet: Infrared stellar spectroscopy

Ryde, N. (PI)

2012/01/01 → 2013/12/31

Kungl. Fysiografiska Sällskapet: Stjärnspektroskopiska undersökningar av Vintergatans bulb

Ryde, N. (PI)

2008/01/01 → 2009/12/31

KVA research fellow: Unveiling the Central Region of our Galaxy: How was it Formed and how did it Evolve?

Ryde, N. (PI)

2008/01/01 → 2012/12/31

PhD project: The cosmic origin of fluorine and sulphur: Infrared spectroscopic studies of red giants

Jönsson, H. (Research student), Ryde, N. (Supervisor) & Dravins, D. (Assistant supervisor)

2009/03/01 → 2015/06/05

PhD project: The origin and evolution of the Galactic Center

Thorsbro, B. (Research student), Ryde, N. (Supervisor), Jönsson, H. (Assistant supervisor) & Nilsson, H. (Assistant supervisor)

2016/07/01 → 2020/09/25

SOEB: Stiftelsen Olle Engkvist Byggmästare, Postdoc stipendium for Henrik Jönsson for two years

Ryde, N. (Researcher) & Jönsson, H. (Researcher)

2017/04/01 → 2019/04/01

The Galactic Center as seen by MOONS

Ryde, N. (PI) & Nandakumar, G. (Researcher)

Swedish Research Council

2024/01/01 → 2028/12/31

NMW: The New Milky Way

Feltzing, S. (PI), Bensby, T. (Col), Lindegren, L. (Col), Church, R. (Researcher), Hobbs, D. (Researcher), Ryde, N.

(Researcher), Hartman, H. (Researcher), Mcmillan, P. (Researcher), Traven, G. (Researcher), Feuillet, D. (Researcher),

Sahlholdt, C. (Researcher), Howes, L. (Researcher) & Stonkute, E. (Researcher)

Knut and Alice Wallenberg Foundation

2014/07/01 → 2027/06/30

VR-projektbidrag: Infraröd spektroskopi - ett nytt fönster mot galaktisk astronomi

Ryde, N. (PI)

2009/01/01 → 2013/12/31

VR-projektbidrag: Vintergatans ursprung - spektroskopiska undersökningar av stjärnpopulationer i Vintergatans centrum

Ryde, N. (PI)

2015/01/01 → 2017/12/31