CURRICULUM VITAE

Andrzej Hryczuk

Date of birth:	11$^{\text{th}}$ December 1983	Address:
Place of birth:	Warsaw, Poland	NCBJ
Nationality:	Polish	ul. Pasteura 7,
Languages:	English (*C2*), Russian (*B1*),	02-093 Warsaw, Poland
	German (*B1*), Italian (*A1*),	ahryczuk.github.io
	Polish (*native*)	andrzej.hryczuk@ncbj.gov.pl

Biosketch

Theoretical physicist working on particle cosmology and high energy physics. Research interests include: dark matter, beyond SM phenomenology and QFT at finite temperature. Did extensive research on all these topics and currently focused on evolution of dark matter in the Early Universe.

H-index: 16 (according to INSPIRE database).

Work experience

Dec 2018 -	Assistant Professor (*Adiunkt*), **National Centre for Nuclear Research**, Warsaw, Poland
Dec 2015 - Nov 2018	Postdoctoral Fellow, **University of Oslo**, Norway
Sep 2015 - Dec 2015	Postdoctoral Fellow, **National Centre for Nuclear Research**, Warsaw, Poland
Oct 2012 - Sep 2015	Postdoctoral Fellow, **Technische Universität München**, Munich, Germany
Nov 2008 - Oct 2010	Early Stage Researcher, Marie Curie Research Training Network "UniverseNet", **SISSA and INFN**, Trieste, Italy
Jul - Oct 2006	Internship at **CERN** in the OSQAR Collaboration, Geneva, Switzerland Group of Dr. Andrzej Siemko

Education

2023	Habilitation at National Centre for Nuclear Research Title: *Accurate determination of the dark matter relic abundance*
2008 - 2012	Ph.D. Student at SISSA, Trieste, Italy Thesis title: *Loop and non-perturbative effects in the dark matter phenomenology* Supervisor: Prof. Piero Ullio
2007 - 2008	Ph.D. Student at the Faculty of Physics, Warsaw University, Poland
2002 - 2007	M.Sc. Degree in Theoretical Physics with Honours, Warsaw University Thesis title: *Axions in Particle Physics and Cosmology* Supervisor: Prof. Krzysztof Meissner
1998 - 2002	Matriculation with Honours, The 14$^{\text{th}}$ Secondary School in Warsaw with the prize of the Mayor of Warsaw-Center District

Research grants

Sep 2022-Aug 2027	PI of SONATA BIS grant 2021/42/E/ST2/00009, National Science Centre, Poland Project title: *Dark matter and baryogenesis within multicomponent dark sectors and nonstandard cosmological models*
Jul 2019-Jul 2023	PI of SONATA grant 2018/31/D/ST2/00813, National Science Centre, Poland Project title: *The impact of non-equilibrium and thermal effects on the evolution of Dark Matter in the Early Universe plasma*

Scholarships and Awards

2017	PRD Editors' Suggestion of paper "Early kinetic decoupling of dark matter: when the standard way of calculating the thermal relic density fails"
Mar 2008	Award for the best M.Sc. thesis at the Faculty of Physics, Warsaw University
Oct 2004 - Oct 2007	Scholarship of the Minister of Science and Higher Education
2^{nd} Oct 2006	Award of the Marshal of the Masovian Voivodeship
18^{th} Dec 2004	Award for the best article published in the periodical Delta in academic year 2002/2003: *Niebieski las* (Blue Forest), Delta, **351** (2003) 4
23^{rd} - 30^{th} May 2002	1^{st} Prize at the 15^{th} IYPT, Odessa, Ukraine
22^{nd} - 29^{th} May 2001	3^{rd} Prize at the 14^{th} IYPT, Espoo, Finland

Teaching and public outreach

Teaching	*Selected Topics in Dark Matter*, open Lecture Series (UiO, spring 2018) *Classical Mechanics and Special Relativity*, Tutor (Warsaw University, spring 2019) *Statistical Physics and Thermodynamics*, Master tutor (TUM, 2013/2014) *Mathematical Analysis I with Algebra*, Tutor (Warsaw University, 2007/2008)
Ph.D Supervision	supervision of Esau Cervantes National Centre for Nuclear Research, 2022-
	day-to-day co-supervision of Francesco Dighera, Technische Universität München, 2014-2015 Thesis title: *Radiative Corrections in Relic Density Calculations*
M.Sc. Supervision	co-supervision of August Geelmuyden, Thesis title: *On the Prospects of Microlensing WIMPy Halos*, University of Oslo, 2017-2018, Thesis grade: A
	co-supervision of Alessio Pizzini, Thesis title: *Thermal production of self-interacting dark matter*, University of Oslo, 2017-2018, Thesis grade: C
	co-supervision of Ask Markestad, Thesis title: *Dark Matter Bound State Formation for Pseudo-Scalar Mediators*, University of Oslo, 2016-2017, Thesis grade: A
Trainee Supervision	supervision of Adam Gomulka, M.Sc. student at Warsaw University, July 2024

Popular talks

Interview in the *Radio Naukowe* podcast, (online) (26$^{\text{th}}$ Jul 2024)

'Dlaczego Wszechświat się rozszerza?' (Why deos the Universe expand?), Letnie Spotkania z Nauką, (online) (16$^{\text{th}}$ Jul 2022)

Interview in the Polish Radio program EUREKA (23$^{\text{rd}}$ Nov 2021)

'Ciemna materia okiem fizyka czastek' (Dark matter seen by a particle physicist), DM day 2021, (online) (28$^{\text{th}}$ Oct 2021)

'Ciemnosc widze, ciemnosc... czyli jak zobaczyc ciemna materie' (How to see the dark matter), Maratow wykladowy z Delta, (online) (25$^{\text{th}}$ Feb 2021)

'Ciemna strona Wszechświata' (The dark side of the Universe), Festiwal Nauki, Warsaw, Poland (26$^{\text{th}}$ Sep 2020)

'Co kryje się we wnętrzu czarnej dziury?' (What is inside a black hole?), Letnie Spotkania z Nauką, Skoczkowo, Poland (13$^{\text{th}}$ Jul 2019)

'Entropia i strzałka czasu' (Entropy and the arrow of time), Letnie Spotkania z Nauką, Skoczkowo, Poland (4$^{\text{th}}$ Aug 2018)

'Z czego zbudowany jest Wszechświat?' (What is the Universe Made of?), Letnie Spotkania z Nauką, Skoczkowo, Poland (17$^{\text{th}}$ Aug 2013)

'The International Young Physicist Tournament', Polish Seminar on Physics Teaching, Warsaw, Poland (19$^{\text{th}}$ Mar 2003)

Popular papers

Piłeczka w szklance wody (Plastic Ball in a Glass of Water)
A. Hryczuk, R. Żak, Delta, **353** (2003) 10

Niebieski las (Blue Forest)
A. Hryczuk, R. Żak, Delta, **351** (2003) 4

O unoszeniu sie ciał na wodzie (On Floating of Bodies)
A. Hryczuk, R. Żak, Delta, **347** (2003) 11

Invited Talks

04$^{\text{th}}$ Apr 2024 — *'Towards robust predictions for thermal production of multicomponent dark matter'*, Invited seminar at the Faculty of Physics University of Warsaw, Warsaw, Poland

27$^{\text{th}}$ Sep 2023 — *'Non-standard Dark Matter Freeze-out'*, Invited talk at the 3rd DMNet International Symposium, Padova, Italy

15$^{\text{th}}$ Feb 2023 — *'Elastic Self-scatterings in the Calculation of Dark Matter Relic Abundance'*, invited talk at the Particle Astrophysics in Poland meeting, Krakow, Poland

22$^{\text{nd}}$ Oct 2022 — *'Advances in Dark Matter Production Theory'*, invited talk at the Symposium of Polish Physical Society, Katowice, Poland

16$^{\text{th}}$ Sep 2022 — *'Relic Abundance Theory: New Developments'*, invited talk at the DM3 RIKEN workshop, Kobe, Japan (online)

1$^{\text{st}}$ Apr 2022 — *'Developments in Dark matter Relic Abundance calculations'*, invited seminar at Institute of Mathematical Sciences, Chennai, India (online)

25$^{\text{th}}$ Nov 2021 — *'Freeze-in of Dark Matter: recent developments'*, invited seminar at University of Warsaw, Warsaw, Poland (online)

23rd Sep 2021	*'Dark Matter and the H_0 tension'*, invited parallel talk at the Polish Physicists' Summit (Zjazd Fizykow Polskich), Bydgoszcz, Poland (online)
9th Jan 2020	*Heavy WIMPs: status and future prospects*, invited plenary talk at Rencontres du Vietnam, Quy Nhon,
24th Oct 2019	*'Dark Matter at the TeV frontier'*, invited seminar at University of Warsaw, Warsaw, Poland
14th Sep 2019	*'Non-equilibrium effects in the evolution of Dark Matter'*, invited parallel talk at the Polish Physicists' Summit (Zjazd Fizykow Polskich), Cracow, Poland
18th Mar 2019	*'Non-equilibrium effects in the evolution of Dark Matter'*, invited joint CPT/CPPM seminar, Marseille, France
9th Nov 2018	*'Particle Dark Matter at a Crossroads'*, invited colloquium at Institute of Theoretical Astrophysics, Oslo, Norway
22th Dec 2017	*'Kinetic Decoupling of Dark Matter and its impact on the Relic Density'*, invited seminar at University of Warsaw, Warsaw, Poland
7th Nov 2017	*'(More) exceptions in the calculations of relic abundances'*, invited seminar at LPTHE, Paris, France
28th Sep 2016	*'Relic Density at NLO: IR finteness'*, invited talk at "Rethinking Quantum Field Theory" workshop, DESY, Hamburg, Germany

Contributing talks and presentations

1st Nov 2024	*'Towards robust predictions for thermal production of multicomponent dark matter'*, Kashiwa-no-ha Symposium, Tokyo, Japan
24th Oct 2024	*'Freezing-in Cannibal Dark Sectors'*, COSMO-24, Kyoto, Japan
29th Jun 2023	*'Dark matter production out of kinetic equilibrium: the latest developments '*, Contributing talk at the PASCOS conference, Irvine CA, USA
28th Sep 2022	*'Dark matter freeze-out and freeze-in beyond kinetic equilibrium'*, NuDM 2022, Sharm El Sheikh, Egipt
1st May 2022	*'Dark Matter Freeze-out and Freeze-in Beyond Kinetic Equilibrium'*, SUSY 2022, Ioannina, Greece
26th May 2022	*'Impact of Self-scattering on Dark Matter Relic Density'*, 33rd Rencontres de Blois, France
28th July 2021	*'DRAKE: Dark matter relic abundance beyond kinetic equilibrium'*, EPS-HEP conference, DESY, Germany (online)
19th May 2021	*'Dark matter relic abundance beyond kinetic equilibrium'*, PPC workshop, University of Oklahoma (online)
4th Dec 2020	*'Self-interacting DM and the H_0 tension'*, SAFIR DM workshop, Sao Paolo, Brazil (online)
28th Aug 2018	*'Early Kinetic Decoupling of DM: when the standard way of calculating the thermal relic density fails'*, COSMO 2018, Deajeon, South Korea
14th Mar 2018	*'Dark Matter Relic Density: revisited'*, Rencontres de Moriond, La Thuille, Italy

29$^{\text{th}}$ Jul 2016	*'Relic Density at NLO: thermal corrections'*, The Dark Side of the Universe, Bergen, Norway
20$^{\text{th}}$ Jul 2016	*'Neutralino dark matter at TeV scale revisited'*, IDM, Sheffield, UK
4$^{\text{th}}$ Jun 2016	*'Spectral features in the Mev-gap'*, Warsaw Workshop on Non-Standard DM, Poland
27$^{\text{th}}$ Jan 2016	*'Two (more) exceptions in the calculations of relic abundances'*, Theory Seminar, University of Oslo, Norway
9$^{\text{th}}$ Sep 2015	*'The relic density of heavy neutralinos'*, COSMO 2015, Warsaw, Poland
26$^{\text{th}}$ Jun 2014	*'Relic density at NLO: the thermal IR divergence'*, PASCOS 2014, Warsaw, Poland
10$^{\text{th}}$ Oct 2013	*'The indirect detection signals of Wino dark matter'*, Workshop on the Future of Dark Mater Astro-Particle Physics: Insights and Perspectives, ICTP, Trieste, Italy *(poster)*
5$^{\text{th}}$ Mar 2013	*'The indirect detection signals of Wino dark matter'*, Astrofizyka Cząstek w Polsce, Jagiellonian University, Kraków, Poland *(poster)*
20$^{\text{th}}$ Feb 2013	*'Sommerfeld enhancement'*, HAP Dark Matter 2013, Münster University, Germany
30$^{\text{th}}$ May 2012	*'Electroweak and Sommerfeld corrections to the Wino DM annihilation'*, PLANCK 2012, University of Warsaw, Poland
14$^{\text{th}}$ Sep 2010	*'Sommerfeld enhancements in the MSSM'*, 4th UniverseNet School, Lecce, Italy
23$^{\text{rd}}$ Jun 2010	*'The Sommerfeld enhancements in the MSSM'*, FA51 Group Meeting, Laboratori Nazionali di Frascati, Frascati, Italy

Others

- Referee for journals:
  Physical Review Letters, *Physical Review D*, *Physics Letters B*, *JCAP*, *European Physical Journal C*, *Europhysics Letters*
- Referee for funding agencies:
  Fulbright Foundation (Fulbright Graduate Student Award program)
- Referee for RDN: *1 habilitation*
- Evaluation committee member: *1 Phd student (chair)*, *midterm PhD evaluations*
- Recruitment committee member: *6 postdoc*, *1 Phd student*
- Scientific secretary for the *Particle Astrophysics in Poland* conference, 20-21 May 2019, Warsaw
- Organization of the *Dark Matter Day 2021* in Poland outreach event, 28 October 2021
- Co-organization of a workshop on *"Selected topics on future directions in particle physics"*, STER Programme, NCBJ, 16-18 September 2024

Computer skills

- Programming: C/C++, FORTRAN, Wolfram Language *(Mathematica)*
- Web: Html, CSS, basics of PHP – Webmaster of the SISSA High Energy Sector webpage (Oct 2010 - Nov 2011) and of the Ph.D. Students' Council at Faculty of Physics, Warsaw University (Feb - Sep 2008)

List of Publications

Andrzej Hryczuk

The publication culture in the field does not distinguish the first or corresponding authors - the author list is alphabetical and journals do not differentiate authors' contributions. Below I divide the publications into main author papers and contributing author papers. Main authorship entails important contributions to all aspects of the project and publication preparation, where it is understood that often there can be more than one main author.

Bibliometrics from inSPIRE:
Total number of citations : 1493
H-index: 16

Main Author Publications

[1] *Freezing-in Cannibal Dark Sectors*
E. Cervantes, A. Hryczuk
to appear in JHEP [arXiv:2407.12104 [hep-ph]]

[2] *Phase transitions and gravitational waves in a model of Z_3 scalar dark matter*
N. Benincasa, A. Hryczuk, M. Laletin, K. Kannike
JHEP 02 (2024) 207 [arXiv:2312.04627 [hep-ph]]

[3] *Impact of dark matter self-scattering on its relic abundance*
A. Hryczuk, M. Laletin
Phys.Rev.D 106 (2022) 2, 023007 [arXiv:2204.07078 [hep-ph]]

[4] *Dark matter freeze-in from semi-production*
A. Hryczuk, M. Laletin
JHEP 06 (2021) 026 [arXiv:2104.05684 [hep-ph]]

[5] *DRAKE: Dark Matter Relic Abundance beyond Kinetic Equilibrium*
T. Binder, T. Bringmann, M. Gustafsson, A. Hryczuk
Eur. Phys. J. C 81, 577 (2021) [arXiv:2103.01944 [hep-ph]]

[6] *Self-interacting dark matter from late decays and the H_0 tension*
A. Hryczuk, K. Jodlowski
Phys.Rev.D 102 (2020) 4 [arXiv:2006.16139 [hep-ph]]

[7] *Impact of uncertainties in the halo velocity profile on direct detection of sub-GeV dark matter*
A. Hryczuk, K. Karukes, L. Roszkowski, M. Talia
JHEP **2020** (2020) 081 [arXiv:2001.09156 [hep-ph]]

[8] *Forbidden frozen-in dark matter*
L. Darme, A. Hryczuk, D. Karamitros, L. Roszkowski
JHEP **1911** (2019) 159 [arXiv:1908.05685 [hep-ph]]

[9] *Testing dark matter with Cherenkov light - prospects of H.E.S.S. and CTA for exploring minimal supersymmetry*
A. Hryczuk, K. Jodlowski, E. Moulin, L. Rinchiuso, L. Roszkowski, E. M. Sessolo, S. Trojanowski
JHEP **1910** (2019) 043 [arXiv:1905.00315 [hep-ph]]

[10] *Improved bounds on $\mathbb{Z}_3$ singlet dark matter*
A. Hektor, A. Hryczuk, K. Kannike
JHEP **1903** (2019) 204 [arXiv:1901.08074 [hep-ph]]

[11] *Early kinetic decoupling of dark matter: when the standard way of calculating the thermal relic density fails*
T. Binder, T. Bringmann, M. Gustafsson, A. Hryczuk
Phys.Rev D96 (2017) no.11 115010 [arXiv:1706.07433 [hep-ph]]

[12] *The last refuge of mixed wino-Higgsino dark matter*
M. Beneke, A. Bharucha, A. Hryczuk, S. Recksiegel, P. Ruiz-Femenia
JHEP **1701** (2017) 002 [arXiv:1611.00804 [hep-ph]]

[13] *Novel Spectral Features in MeV Gamma Rays from Dark Matter*
T. Bringmann, A. Galea, A. Hryczuk, Ch. Weniger
Phys.Rev D95 (2017) no.4 043002 [arXiv:1610.04613 [hep-ph]]

[14] *Finite-temperature modification of heavy particle decay and dark matter annihilation*
M. Beneke, F. Dighera, A. Hryczuk
JHEP **1609** (2016) 031 [arXiv:1607.03910 [hep-ph]]

[15] *Relic density of wino-like dark matter in the MSSM*
M. Beneke, A. Bharucha, F. Dighera, C. Hellmann, A. Hryczuk, S. Recksiegel, P. Ruiz-Femenia
JHEP **1603** (2016) 119 [arXiv:1601.04718 [hep-ph]]

[16] *Relic density computations at NLO: infrared finiteness and thermal correction*
M. Beneke, F. Dighera, A. Hryczuk
JHEP **1410** (2014) 045 [arXiv:1409.3049 [hep-ph]]

[17] *Indirect Detection Analysis: Wino Dark Matter Case Study*
I. Cholis, A. Hryczuk, R. Iengo, P. Ullio and M. Tavakoli
JCAP **1407** (2014) 031 [arXiv:1401.6212 [astro-ph.HE]]

[18] *The one-loop and Sommerfeld electroweak corrections to the Wino dark matter annihilation*
A. Hryczuk, R. Iengo
JHEP **1201** (2012) 163, Erratum-ibid. 1206 (2012) 137 [arXiv:1111.2916 [hep-ph]]

[19] *The Sommerfeld enhancement for scalar particles and application to sfermion co-annihilation regions*
A. Hryczuk
Phys. Lett. **B699** (2011) 271-275, [arXiv:1102.4295 [hep-ph]]

[20] *Relic densities including Sommerfeld enhancements in the MSSM*
A. Hryczuk, R. Iengo, P. Ullio
JHEP **1103** (2011) 069, [arXiv:1010.2172 [hep-ph]]

Contributing Author Publications & Proceedings

[C1] *Dark Matter Freeze-out and Freeze-in beyond Kinetic Equilibrium*
A. Hryczuk
LHEP 2023 (2023) 344

[C2] *The Forward Physics Facility at the High-Luminosity LHC*
A. Hryczuk in Feng et al.
J.Phys.G 50 (2023) 3, 030501 [arXiv:2203.05090 [hep-ex]]

[C3] *Non-equilibrium Effects in the Evolution of Dark Matter*
A. Hryczuk
Acta Phys. Pol. B Proc. Suppl. 13, 725 (2020)

[C4] *Forbidden Freeze-in*
L. Darme, A. Hryczuk, D. Karamitros, L. Roszkowski
Acta Phys. Pol. B Proc. Suppl. 13, 733 (2020)

[C5] *Phase transitions and gravitational waves in models of $\mathbb{Z}_{\mathbb{N}}$ scalar dark matter*
N. Benincasa, K. Kannike, A. Hektor, A. Hryczuk, K. Loos
PoS EPS-HEP2019 (2020) 089

[C6] *Dark Matter Relic Density Revisited: The Case For Early Kinetic Decoupling*
T. Binder, T. Bringmann, M. Gustafsson, A. Hryczuk
Contribution to Moriond EW 2018 [arXiv:1805.00526 [hep-ph]]

[C7] *Science with e-ASTROGAM (A space mission for MeV-GeV gamma-ray astrophysics)*
A. Hryczuk in A. De Angelis et al.
JHEAp 19 (2018) 1-106 [arXiv:1711.01265 [astro-ph.HE]]

[C8] *Optical Search for QED Vacuum Magnetic Birefringence, Axions and Photon Regeneration*
A. Hryczuk in P. Pugnat et al.
CERN-SPSC-2006-035 (Nov 2006)