

CURRICULUM VITAE

Surname: Harko

Given names: Tiberiu Csaba

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E-mail address: tiberiu.harko@gmail.com; tiberiu.harko@aira.astro.ro

Born: June 26, 1953, Cluj, Romania

Sex: Male

Citizenship: Romanian

Passport number: 057791588, Date of issue: July 20, 2019, Date of expiry: 20 July, 2029

Marital status: Married

Education:

B.Sc. (Physics) 1976, Babes-Bolyai University, Cluj, Romania.

PhD 2001, University of Hong Kong, Hong Kong

Field: Theoretical Astrophysics, Supervisor: Prof. K.S. Cheng

Work experience:

October 2021 to present, Scientific Researcher (CSIII), Institute of Advanced Studies in Science and Technology – STAR-UBB Institute, Babes-Bolyai University, Cluj-Napoca, Romania

July 2021 to April 2024, Research Associate, Department of Theoretical Physics, National Institute of Physics and Nuclear Engineering (IFIN-HH), Bucharest, 077125 Romania

January 2020 to present, Research Associate, Astronomical Institute, 19 Ciresilor Street, Cluj-Napoca, Romania

January 1, 2017, to present, Visiting Professor, School of Physics, Sun Yat Sen University, Guangzhou, P. R. China

October 2013 to December 2019, Professor (Full), Yat Sen School, Sun Yat Sen University, Guangzhou, P. R. China

October 2012 to March 2020, Honorary and Senior Honorary Research Associate, Department of Mathematics, University College London, Gower Street, London WC1E 6BT, United Kingdom

October 2004 to October 2012, Research Assistant Professor and Associate Professor,
Department of Physics, The University of Hong Kong, Pokfulam Road, Hong Kong

October 2001 to October 2004

Post-Doctoral Fellow, Department of Physics, The University of Hong Kong, Hong Kong,
Pokfulam Road

July 1998 to August 2001

PHD Student, Department of Physics, The University of Hong Kong, Hong Kong – Field:
Theoretical Astrophysics, Supervisor: Prof. K.S. Cheng

March 1986 to July 1998 Research Scientist, “I. Kiricutza” Institute of the Romanian
Academy of Sciences, str. Republicii nr. 34-36, Cluj-Napoca, Romania

March 1981 to March 1986, Research scientist, Institute of Mining Research, str. T.
Vladimirescu 18, Cluj - Napoca, Romania

September 1977 to March 1981, Full time teacher, High-School, str. Zefirului nr.1,
Bistritza, Romania

University teaching experience:

In the University of Hong Kong between 2004 and 2012 I did teach the following courses:

General Relativity - 1 semester course

Cosmology - 1 semester course

Astrophysics - 1 semester course

Stellar astrophysics - 1 semester course

The structure of the scientific revolutions - 1 semester course

In the Sun Yat Sen University, Guangzhou, China I presently teach

General Relativity and Cosmology - 1 semester course

In the Babes-Bolyai University Cluj-Napoca, Romania I did teach

Astrophysics and Cosmology - 1 semester course

Research interests:

General Relativity, Cosmological Models, Modified gravity, Bose-Einstein condensation
of dark matter, Theoretical Astrophysics, Stellar Interior Solutions to Einstein Field Equa-
tion, Systems of Non-Linear Partial Differential Equations, Stability of systems of Ordinary
Differential Equations.

Media coverage. My work has received media coverage in the New Scientists, Forbes
Magazine, National Geographic, and USA Today.

Citations:

According to Google Scholar my papers have received around 20,000 citations up to April 2024.

Research Grants

1. General Research Fund Grants

a) 2006-2009 Astrophysical constraints on the multi-dimensional space-time models, HKU 7027/06P, awarded 250,000 HKD

b) 2007-2010 High energy radiation, accretion and cooling of strange stars, HKU 702507P awarded 267,000 HKD

c) 2008-2011 Brane world cosmology: post-inflationary reheating and gravitational lensing, HKU 701808P, awarded 293,700 HKD

2. Seed Funding Programme for Basic Research

a) 2004-2005 Observational tests of the brane world cosmological models, 200411159012 awarded 120,000 HKD

b) 2005-2006 Radiation processes in the electrosphere of bare strange stars, 200511159091, awarded 80000 HKD

c) 2006-2007 Gravitational radiation from compact binary systems, 200611159051, awarded 80,000 HKD

d) 2007-2008 Dark energy models in modified theories of gravity, 200711159003, awarded 50,000 HKD

3. URC/CRCG - Conference Grants for Teaching Staff

2008 Astrophysical implications of the hadron-quark phase transitions in neutron stars, 8th Pacific Rim Conference on Stellar Astrophysics, 200703170468, awarded 13,500 HKD

2009 Can stellar mass black holes be quark stars?, 12 Marcel Grossmann Meeting, Paris, awarded 16,500 HKD

2012 Astrophysical signatures of quark stars in the CFL phase, 13 Marcel Grossmann Meeting, Stockholm, awarded 16,500 HKD

Consultant in Research Projects

I was a consultant of the following FCT/CERN Projects:

CERN/FP/116398/2010,

CERN/FP/109381/2009, and

CERN/FP/123615/2011,

respectively.

Reviewer for scientific journals

I review manuscripts submitted to: Physical Review Letters, Physical Review D, The European Physical Journal C, Astrophysical Journal, Monthly Notices of the Royal Astronomical Society, JCAP, Physics of the Dark Universe etc.

List of publications

Books: T. Harko and F. S. N. Lobo, Extensions of $f(R)$ Gravity: Curvature-Matter Couplings and Hybrid Metric-Palatini Theory, Cambridge, Cambridge University Press, 2018

Research Articles

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- [1] Harko, T., Shahidi, S. 2024. Cosmological implications of the Weyl geometric gravity theory. arXiv e-prints. doi:10.48550/arXiv.2405.04129
 - [2] Cipriano, R. A. C., Harko, T., Lobo, F. S. N., Pinto, M. A. S., Rosa, J. L. 2024. Gravitationally induced matter creation in scalar-tensor $f(R, T)$ gravity. Physics of the Dark Universe 44. doi:10.1016/j.dark.2024.101463
 - [3] Haghani, Z., Harko, T., Shahidi, S. 2024. The first variation of the matter energy–momentum tensor with respect to the metric, and its implications on modified gravity theories. Physics of the Dark Universe 44. doi:10.1016/j.dark.2024.101448
 - [4] Oancea, M. A., Harko, T. 2024. Weyl geometric effects on the propagation of light in gravitational fields. Physical Review D 109. doi:10.1103/PhysRevD.109.064020
 - [5] Csillag, L., Harko, T. 2024. Semi-Symmetric Metric Gravity: from the Friedmann-Schouten geometry with torsion to dynamical dark energy models. arXiv e-prints. doi:10.48550/arXiv.2402.06114
 - [6] Crăciun, M., Harko, T. 2024. Testing Weyl geometric gravity with the SPARC galactic rotation curves database. Physics of the Dark Universe 43. doi:10.1016/j.dark.2024.101423
 - [7] Sakti, M. F. A. R., Burikham, P., Harko, T. 2024. Thermodynamics of the Weyl Geometric Gravity Black Holes. arXiv e-prints. doi:10.48550/arXiv.2401.10410
 - [8] Ming, L., Liang, S.-D., Zhang, H.-H., Harko, T. 2024. From the Weyl-Schrödinger connection

- to the accelerating Universe: Extending Einstein’s gravity via a length preserving nonmetricity. *Physical Review D* 109. doi:10.1103/PhysRevD.109.024003
- [9] Bouali, A., Chaudhary, H., Harko, T., Lobo, F. S. N., Ouali, T., Pinto, M. A. S. 2023. Observational constraints and cosmological implications of scalar-tensor $f(R, T)$ gravity. *Monthly Notices of the Royal Astronomical Society* 526, 4192–4208. doi:10.1093/mnras/stad2998
- [10] Mandal, S., Pradhan, S., Sahoo, P. K., Harko, T. 2023. Cosmological observational constraints on the power law $f(Q)$ type modified gravity theory. *European Physical Journal C* 83. doi:10.1140/epjc/s10052-023-12339-4
- [11] Hama, R., Harko, T., Sabau, S. V. 2023. Conformal gravitational theories in Barthel-Kropina-type Finslerian geometry, and their cosmological implications. *European Physical Journal C* 83. doi:10.1140/epjc/s10052-023-12146-x
- [12] Burikham, P., Harko, T., Pimsamarn, K., Shahidi, S. 2023. Reply to Comment on “Dark matter as a Weyl geometric effect”. arXiv e-prints. doi:10.48550/arXiv.2310.13423
- [13] Sheikahmadi, H., Soroushfar, S., Sajadi, S. N., Harko, T. 2023. Astrophysical and electromagnetic emissivity properties of black holes surrounded by a quintessence type exotic fluid in the scalar-vector-tensor modified gravity. *European Physical Journal C* 83. doi:10.1140/epjc/s10052-023-11980-3
- [14] Lake, M. J., Harko, T., Liang, S.-D. 2023. Editorial: Generalized uncertainty relations: existing paradigms and new approaches. *Frontiers in Astronomy and Space Sciences* 10. doi:10.3389/fspas.2023.1246781
- [15] da Silva, H. M. R., Harko, T., Lobo, F. S. N., Rosa, J. L. 2023. U (1) local strings in generalized hybrid metric-Palatini gravity. *The Sixteenth Marcel Grossmann Meeting. On Recent Developments in Theoretical and Experimental General Relativity, Astrophysics, and Relativistic Field Theories, 1820–1834*. doi:10.1142/9789811269776_0143
- [16] Harko, T., Lobo, F. S. N., da Silva, H. M. R. 2023. U (1) local strings in hybrid metric-Palatini gravity. *The Sixteenth Marcel Grossmann Meeting. On Recent Developments in Theoretical and Experimental General Relativity, Astrophysics, and Relativistic Field Theories, 485–498*. doi:10.1142/9789811269776_0035
- [17] Harko, T., Sheikahmadi, H., Sajadi, S. N., Moshafi, H. 2023. Astrophysical properties of Weyl geometric black holes. *7th International Conference in Astronomy*.
- [18] Craciun, M., Harko, T. 2023. Observational constraints on Weyl geometric gravity from the

- SPARC galactic rotation curves database. 7th International Conference in Astronomy.
- [19] Matei, T. M., Harko, T. 2023. Warm inflation with boundary terms in a non-metric Weyl-type geometry. 7th International Conference in Astronomy.
- [20] Visa, D.-I., Harko, T., Mocanu, G. 2023. Mimetic Weyl geometric gravity. 7th International Conference in Astronomy.
- [21] Blaga, P. A., Blaga, C., Harko, T. 2023. Jacobi stability of circular orbits around a Weyl black holes. 7th International Conference in Astronomy.
- [22] Liang, S.-D., Harko, T., Lake, M. J. 2023. New Advances in Quantum Geometry. *Physics* 5, 688–689. doi:10.3390/physics5030045
- [23] Harko, T. 2023. Dissipative quintessence and its cosmological implications. *Physical Review D* 107. doi:10.1103/PhysRevD.107.123507
- [24] Pinto, M. A. S., Harko, T., Lobo, F. S. N. 2023. Irreversible Geometrothermodynamics of Open Systems in Modified Gravity. *Entropy* 25. doi:10.3390/e25060944
- [25] Haghani, Z., Harko, T. 2023. Compact stellar structures in Weyl geometric gravity. *Physical Review D* 107. doi:10.1103/PhysRevD.107.064068
- [26] Burikham, P., Harko, T., Pimsamarn, K., Shahidi, S. 2023. Dark matter as a Weyl geometric effect. *Physical Review D* 107. doi:10.1103/PhysRevD.107.064008
- [27] Bouali, A., Chaudhary, H., Hama, R., Harko, T., Sabau, S. V., Martín, M. S. 2023. Cosmological tests of the osculating Barthel-Kropina dark energy model. *European Physical Journal C* 83. doi:10.1140/epjc/s10052-023-11265-9
- [28] Harko, T., Lake, M. J., Mak, M. K. 2023. Series Solution of the Time-Dependent Schrödinger–Newton Equations in the Presence of Dark Energy via the Adomian Decomposition Method. *Symmetry* 15. doi:10.3390/sym15020372
- [29] Blaga, C., Blaga, P., Harko, T. 2023. Jacobi and Lyapunov Stability Analysis of Circular Geodesics around a Spherically Symmetric Dilaton Black Hole. *Symmetry* 15. doi:10.3390/sym15020329
- [30] Matei, T., Harko, T., Mocanu, G. 2023. Dark Matter and Radiation Production during Warm Inflation in a Curved Universe: AN Irreversible Thermodynamic Approach. *Romanian Astronomical Journal* 33, 127–143. doi:10.48550/arXiv.2303.02464
- [31] Harko, T., Asadi, K., Moshafi, H., Sheikahmadi, H. 2022. Observational constraints on the interacting dark energy - Dark matter (IDM) cosmological models. *Physics of the Dark*

Universe 38. doi:10.1016/j.dark.2022.101131

- [32] Yang, J.-Z., Shahidi, S., Harko, T. 2022. Black hole solutions in the quadratic Weyl conformal geometric theory of gravity. *European Physical Journal C* 82. doi:10.1140/epjc/s10052-022-11131-0
- [33] Harko, T., Shahidi, S. 2022. Palatini formulation of the conformally invariant $f(R, L_m)$ gravity theory. *European Physical Journal C* 82. doi:10.1140/epjc/s10052-022-10891-z
- [34] Pinto, M. A. S., Harko, T., Lobo, F. S. N. 2022. Gravitationally induced particle production in scalar-tensor $f(R, T)$ gravity. *Physical Review D* 106. doi:10.1103/PhysRevD.106.044043
- [35] Harko, T., Matei, T. 2022. Dark matter production during warm inflation-an irreversible thermodynamic approach. *Theory, Observations and Data Processing in Astronomy, Astrophysics, Space and Planetary Sciences*.
- [36] Harko, T., Hertoiu, D., Stefanescu, S., Visa, D. 2022. Gravitational collapse of Bose-Einstein Condensate dark matter halos with logarithmic nonlinearity. *Theory, Observations and Data Processing in Astronomy, Astrophysics, Space and Planetary Sciences*.
- [37] Blaga, P. A., Blaga, C., Harko, T. 2022. Jacobi stability analysis of the orbits of charged particles around spherically symmetric dilaton black holes. *Theory, Observations and Data Processing in Astronomy, Astrophysics, Space and Planetary Sciences*.
- [38] Harko, T. 2022. Black hole solutions in Weyl geometric gravity. *Theory, Observations and Data Processing in Astronomy, Astrophysics, Space and Planetary Sciences*.
- [39] Craciun, M., Harko, T. 2022. The effects of a random potential on Bose-Einstein Condensate dark matter halos. *Theory, Observations and Data Processing in Astronomy, Astrophysics, Space and Planetary Sciences*.
- [40] Harko, T., Madarassy, E. J. 2022. Bose-Einstein Condensate dark matter models in the presence of baryonic matter and random confining potentials. *European Physical Journal C* 82. doi:10.1140/epjc/s10052-022-10344-7
- [41] Hama, R., Harko, T., Sabau, S. V. 2022. Dark energy and accelerating cosmological evolution from osculating Barthel-Kropina geometry. *European Physical Journal C* 82. doi:10.1140/epjc/s10052-022-10318-9
- [42] Haghani, Z., Harko, T. 2022. Compact stars in the Einstein dark energy model. *Physical Review D* 105. doi:10.1103/PhysRevD.105.064059
- [43] Harko, T., Shahidi, S. 2022. Coupling matter and curvature in Weyl geometry: conformally

- invariant $f(R, L_m)$ gravity. *European Physical Journal C* 82. doi:10.1140/epjc/s10052-022-10126-1
- [44] Harko, T., Koivisto, T. S., Olmo, G. J., Lobo, F. S. N., Rubiera-Garcia, D. 2022. Novel couplings between nonmetricity and matter. *Fifteenth Marcel Grossmann Meeting on General Relativity*, 410–415. doi:10.1142/9789811258251_0048
- [45] Lobo, F. S. N., Harko, T. 2022. Curvature-matter couplings in modified gravity: From linear models to conformally invariant theories. *International Journal of Modern Physics D* 31. doi:10.1142/S0218271822400107
- [46] da Silva, H. M. R., Harko, T., Lobo, F. S. N., Luís Rosa, J. 2021. $U(1)$ local strings in generalized hybrid metric-Palatini gravity. *arXiv e-prints*. doi:10.48550/arXiv.2112.05272
- [47] Harko, T., Lobo, F. S. N., Silva, H. 2021. $U(1)$ local strings in hybrid metric-Palatini gravity. *arXiv e-prints*. doi:10.48550/arXiv.2112.04496
- [48] da Silva, H. M. R., Harko, T., Lobo, F. S. N., Rosa, J. L. 2021. Cosmic strings in generalized hybrid metric-Palatini gravity. *Physical Review D* 104. doi:10.1103/PhysRevD.104.124056
- [49] Harko, T., Myrzakulov, N., Myrzakulov, R., Shahidi, S. 2021. Non-minimal geometry-matter couplings in Weyl-Cartan space-times: $f(R, T, Q, T_m)$ gravity. *Physics of the Dark Universe* 34. doi:10.1016/j.dark.2021.100886
- [50] Mak, M. K., Leung, C. S., Harko, T. 2021. A Brief Introduction to the Adomian Decomposition Method, with Applications in Astronomy and Astrophysics. *Romanian Astronomical Journal* 31, 201–240. doi:10.48550/arXiv.2102.10511
- [51] Blaga, C., Blaga, P., Harko, T. 2021. Jacobi stability analysis of circular geodesics around a spherically symmetric dilaton black hole. *ZAC 2021 - International Conference Viewpoints in Astronomy*.
- [52] Harko, T. 2021. Astrophysical and cosmological implications of conformal quadratic Weyl gravity. *ZAC 2021 - International Conference Viewpoints in Astronomy*.
- [53] Ghilencea, D. M., Harko, T. 2021. Cosmological evolution in Weyl conformal geometry. *arXiv e-prints*. doi:10.48550/arXiv.2110.07056
- [54] Haghani, Z., Harko, T. 2021. Effects of Quantum Metric Fluctuations on the Cosmological Evolution in Friedmann-Lemaitre-Robertson-Walker Geometries. *Physics* 3, 689–714. doi:10.3390/physics3030042
- [55] Hama, R., Harko, T., Sabau, S. V., Shahidi, S. 2021. Cosmological evolution and

- dark energy in osculating Barthel-Randers geometry. *European Physical Journal C* 81. doi:10.1140/epjc/s10052-021-09517-7
- [56] Harko, T., Lobo, F. S. N., Saridakis, E. N. 2021. Gravitationally Induced Particle Production through a Nonminimal Torsion–Matter Coupling. *Universe* 7. doi:10.3390/universe7070227
- [57] Haghani, Z., Harko, T. 2021. Generalizing the coupling between geometry and matter: $f(R, L_m, T)$ gravity. *European Physical Journal C* 81. doi:10.1140/epjc/s10052-021-09359-3
- [58] Barros, B. J., Haghani, Z., Harko, T., Lobo, F. S. N. 2021. Static spherically symmetric three-form stars. *European Physical Journal C* 81. doi:10.1140/epjc/s10052-021-09105-9
- [59] Harko, T., Mak, M. K. 2021. Analytical solutions of the one-dimensional Schrödinger equation with position-dependent mass. arXiv e-prints. doi:10.48550/arXiv.2103.10721
- [60] Mak, M. K., Leung, C. S., Harko, T. 2021. The effects of the dark energy on the static Schrödinger-Newton system — An Adomian Decomposition Method and Padé approximants based approach. *Modern Physics Letters A* 36. doi:10.1142/S0217732321500383
- [61] Harko, T., Sheikahmadi, H. 2021. Warm inflation with non-comoving scalar field and radiation fluid. *European Physical Journal C* 81. doi:10.1140/epjc/s10052-021-08964-6
- [62] Yang, J.-Z., Shahidi, S., Harko, T., Liang, S.-D. 2021. Geodesic deviation, Raychaudhuri equation, Newtonian limit, and tidal forces in Weyl-type $f(Q, T)$ gravity. *European Physical Journal C* 81. doi:10.1140/epjc/s10052-021-08910-6
- [63] Blaga, C., Blaga, P. A., Harko, T. 2021. Jacobi stability analysis of the classical restricted three body problem. *Romanian Astronomical Journal* 31, 101–112. doi:10.48550/arXiv.2104.02432
- [64] Yang, J.-Z., Shahidi, S., Harko, T., Liang, S.-D. 2021. Black hole solutions in modified gravity induced by quantum metric fluctuations. *Physics of the Dark Universe* 31. doi:10.1016/j.dark.2020.100756
- [65] Böhmer, C. G., Harko, T. 2021. Nonlinear Stability Analysis of the Emden-Fowler Equation. *Journal of Nonlinear Mathematical Physics* 17, 503–516. doi:10.1142/S1402925110001100
- [66] Harko, T., Mak, M. K. 2020. Series solution of the Susceptible-Infected-Recovered (SIR) epidemic model with vital dynamics via the Adomian and Laplace-Adomian Decomposition Methods. arXiv e-prints. doi:10.48550/arXiv.2009.00434
- [67] Crăciun, M., Harko, T. 2020. Testing Bose-Einstein condensate dark matter models with the SPARC galactic rotation curves data. *European Physical Journal C* 80.

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- [72] Harko, T., Sheikhahmadi, H. 2020. Irreversible thermodynamical description of warm inflationary cosmological models. *Physics of the Dark Universe* 28. doi:10.1016/j.dark.2020.100521
- [73] Xu, Y., Harko, T., Shahidi, S., Liang, S.-D. 2020. Weyl type $f(Q, T)$ gravity, and its cosmological implications. *European Physical Journal C* 80. doi:10.1140/epjc/s10052-020-8023-6
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- [76] Shahidi, S., Harko, T., Kovács, Z. 2020. Distinguishing Brans-Dicke-Kerr type naked singularities and black holes with their thin disk electromagnetic radiation properties. *European Physical Journal C* 80. doi:10.1140/epjc/s10052-020-7736-x
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- [79] Liang, S.-D., Sabau, S. V., Harko, T. 2019. Finslerian geometrization of quantum mechanics in the hydrodynamical representation. *Physical Review D* 100. doi:10.1103/PhysRevD.100.105012
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- densate dark matter halos. *European Physical Journal C* 79. doi:10.1140/epjc/s10052-019-7285-3
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- [82] Xu, Y., Li, G., Harko, T., Liang, S.-D. 2019. $f(Q, T)$ gravity. *European Physical Journal C* 79. doi:10.1140/epjc/s10052-019-7207-4
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- [84] Blaga, C., Blaga, P., Harko, T. 2019. Jacobi stability analysis of the circular restricted three body problem with drag forces. ZAC 2019 - International Conference Recent developments in astronomy.
- [85] Harko, T. 2019. The geometric trinity of gravity: one in three, or three in one?. ZAC 2019 - International Conference Recent developments in astronomy.
- [86] Harko, T., Liang, S.-D. 2019. Energy-dependent noncommutative quantum mechanics. *European Physical Journal C* 79. doi:10.1140/epjc/s10052-019-6794-4
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- [91] Kareeso, P., Burikham, P., Harko, T. 2018. Mass-radius ratio bounds for compact objects in Lorentz-violating dRGT massive gravity theory. *European Physical Journal C* 78. doi:10.1140/epjc/s10052-018-6408-6
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- tion by the Laplace-Adomian and Adomian Decomposition Methods. arXiv e-prints. doi:10.48550/arXiv.1810.09544
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- [96] Ye, Y., Harko, T., Liang, S.-D. 2018. Loop quantum cosmology with a non-commutative quantum deformed photon gas. *European Physical Journal C* 78. doi:10.1140/epjc/s10052-018-6059-7
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