

## ΒΙΟΓΡΑΦΙΚΟ ΣΗΜΕΙΩΜΑ

### **Νεκτάριος Βλαχάκης**

#### **Διεύθυνση**

Τομέας Αστροφυσικής, Αστρονομίας και Μηχανικής  
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**Εκπαίδευση** **Πανεπιστήμιο Κρήτης**  
1994-1998

Ηράκλειο

**Διδακτορικό στην Αστροφυσική.** Τίτλος Διατριβής:  
Αναλυτικά μοντέλα αστροφυσικών ανέμων και πιδάκων πλάσματος  
Επιβλέπων Καθηγητής: Τσίγκανος Κανάρης.

1992-1994

**Μεταπτυχιακό Δίπλωμα στη Γενική Φυσική.**

**Αριστοτέλειο Πανεπιστήμιο Θεσσαλονίκης**  
1988-1992

Θεσσαλονίκη

**Πτυχίο Φυσικής** (άριστα).

#### **Ερευνητικό ενδιαφέρον**

Φυσική Πλάσματος – Σχετικιστική και μη σχετικιστική Μαγνητοϋδροδυναμική – Πίδακες Πλάσματος – Ήλιος και Αστρικοί νεμοί – Δίσκοι προσαύξησης – Ενεργοί Γαλαξιακοί Πυρήνες (blazars, quasars) – Εκλάμψεις ακτινοβολίας γάμμα – Μελέτη ισορροπίας και ευστάθειας πλάσματος – Πόλωση Ακτινοβολίας Σύγχροτρον – Μη γραμμικές διαφορικές εξισώσεις

**Εργασία** **Τομέας Αστροφυσικής, Αστρονομίας και Μηχανικής, Τμήμα Φυσικής,**  
**Εθνικό και Καποδιστριακό Πανεπιστήμιο Αθηνών** Αθήνα  
2020-ως τώρα  
Καθηγητής

**Τομέας Αστροφυσικής, Αστρονομίας και Μηχανικής, Τμήμα Φυσικής,**  
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2016-2020

Αναπληρωτής Καθηγητής

**Τομέας Αστροφυσικής, Αστρονομίας και Μηχανικής, Τμήμα Φυσικής,**  
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2008-2016

Επίκουρος Καθηγητής

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**Εθνικό και Καποδιστριακό Πανεπιστήμιο Αθηνών** Αθήνα  
2003-2008

Λέκτορας

**Enrico Fermi Institute - University of Chicago**  
2000-2003

Chicago, USA

Έρευνα στην θεωρητική Αστροφυσική.

**Σπουδαϊκή Θητεία**  
1999-2000

Θήβα – Κως – Λέρος

**Πανεπιστήμιο Κρήτης**  
1992-1998  
Επικουρική διδασκαλία στο Φυσικό Τμήμα.

Ηράκλειο

**Τιδρυμα Τεχνολογίας και Έρευνας**  
1992-1998  
Ερευνητής στο Ινστιτούτο Ηλεκτρονικής Δομής και Λέιζερ.

Ηράκλειο

**Αριστοτέλειο Πανεπιστήμιο Θεσσαλονίκης**  
1992  
Επικουρική διδασκαλία στο Φυσικό Τμήμα.

Θεσσαλονίκη

### **Βραβεία-Υποτροφίες**

2000-2002	Chicago, USA
Υποτροφία "McCormick" στο Ινστιτούτο "Enrico Fermi"	
1992-1998	Ηράκλειο
Υποτροφίες από το Τιδρυμα Τεχνολογίας και Ερευνας για εκπόνηση μεταπτυχιακού και διδακτορικής διατριβής	
1992-1998	Ηράκλειο
Υποτροφίες από το Πανεπιστήμιο Κρήτης για εκπόνηση μεταπτυχιακού και διδακτορικής διατριβής	
1992	Ηράκλειο
Τρίτο Βραβείο, Θερινό Σχολείο Προχωρημένης Φυσικής, Πανεπιστήμιο Κρήτης	
1992	Θεσσαλονίκη
Μεγαλύτερος βαθμός σε πτυχίο στο τμήμα Φυσικής του Αριστοτελείου Πανεπιστημίου για το έτος 1992	
1989-1990-1991	Θεσσαλονίκη
Υποτροφίες ΙΚΥ για την επίδοση στο Πανεπιστήμιο Θεσσαλονίκης	
1988	Θεσσαλονίκη
Υποτροφία ΙΚΥ για την σειρά εισαγωγής στο Πανεπιστήμιο Θεσσαλονίκης (11ος)	
1988	Αγιος Νικόλαος Κρήτης
Σταυριανίδειο βραβείο (καλύτερος στον νομό Λασιθίου στις εισαγωγικές εξετάσεις 1988)	

### **Διδακτική εμπειρία**

<b>Πανεπιστήμιο Αθηνών</b> 2003-ως τώρα	Αθήνα
Βασικά θέματα αστροφυσικής (μεταπτυχιακό), Θέματα σύγχρονης αστροφυσικής (μεταπτυχιακό), Φυσική πλάσματος (μεταπτυχιακό), Αστροφυσική πλάσματος, Αστροφυσική υψηλών ενεργειών, Δυναμική των Ρευστών, Αστροφυσικά Ρευστά, Μηχανική I, Μηχανική II, Ηλεκτρομαγνητισμός I, Ηλεκτρομαγνητισμός II, Εργαστήρια (αστροφυσικής, φυσικής IV)	

**Πανεπιστήμιο Κρήτης**  
1992-1998

Ηράκλειο

Επικουρική διδασκαλία στο Φυσικό Τμήμα Πανεπιστημίου Κρήτης στα ακόλουθα μαθήματα:  
Ηλεκτρομαγνητισμός I, Ηλεκτρομαγνητισμός II, Αστροφυσική, Φυσική I, Φυσική II, Εργαστήρια μηχανικής

**Αριστοτέλειο Πανεπιστήμιο Θεσσαλονίκης**  
1992

Θεσσαλονίκη

Επικουρική διδασκαλία στο μάθημα της Αστροφυσικής

Ηράκλειο - Άγιος Νικόλαος  
1992-1997

Φροντιστήρια σε μαθήματα μέσης εκπαίδευσης καθώς και σε μαθήματα πανεπιστημίου (διαφορικές εξισώσεις, γενική φυσική)

## Συγγράμματα

*Κλασική Μηχανική*, Βλαχάκης, Ν., 2024 [ηλεκτρ. βιβλ.], Κάλλιπος, Ανοικτές Ακαδημαϊκές Έκδόσεις. ISBN: 978-618-228-103-1

*Δυναμική των Ρευστών*, Βλαχάκης, Ν., 2019, εκδόσεις Παπαζήση, ISBN: 978-960-02-3526-5

*Αστροφυσική Υψηλών Ενέργειών*, Μαστιχιάδης, Α., Βλαχάκης, Ν., 2015 [ηλεκτρ. βιβλ.], Κάλλιπος, Ανοικτές Ακαδημαϊκές Έκδόσεις, ISBN: 978-960-603-142-7

## Προσωπικές πληροφορίες

Ημερομηνία Γενήσεως:	04 Φεβρουαρίου 1971 (Άγιος Νικόλαος).
Τηπρούτητα:	Ελληνική.
Όνομα πατέρα:	Σοφοκλής.
Όνομα μητέρας:	Χαρίκλεια.
Οικογενειακή κατάσταση:	έγγαμος με ένα παιδί.
Όνομα συζύγου:	Χριστίνα Παντελή.
Άλλες ενασχολήσεις:	Σκάκι.
Ξένες Γλώσσες:	Αγγλικά.

## ΔΗΜΟΣΙΕΥΣΕΙΣ

σε επιστημονικά περιοδικά  
με κριτές

1. *On the topological stability of astrophysical jets*, Vlahakis, N. & Tsinganos, K. 1997, MNRAS, 292, 591
2. *Systematic Construction of Exact MHD models for Astrophysical Winds and Jets*, Vlahakis, N. & Tsinganos, K. 1998, MNRAS, 298, 777
3. *A class of exact MHD models for astrophysical jets*, Vlahakis, N. & Tsinganos, K. 1999, MNRAS, 307, 279
4. *Steady MHD Solutions for Collimated Winds*, Trussoni, E., Sauty, C., Tsinganos, K., & Vlahakis, N. 1999, Ap&SS, 264, 183
5. *A disk-wind model with correct crossing of all MHD critical surfaces*, Vlahakis, N., Tsinganos, K., Sauty, C., & Trussoni, E. 2000, MNRAS, 318, 417

6. *Magnetohydrodynamics of Gamma-Ray Burst Outflows*, Vlahakis, N. & Königl, A. 2001, ApJL, 563, L129
7. *Systematic construction of exact 2-D MHD equilibria with steady, compressible flow in Cartesian geometry and uniform gravity*, Petrie, G. J. D., Vlahakis, N., & Tsinganos, K. 2002, A&A, 382, 1081
8. *Neutron-Rich Hydromagnetic Outflows in Gamma-Ray Burst Sources*, Vlahakis, N., Peng, F., & Königl, A. 2003, ApJL, 594, L23
9. *Hydromagnetic Acceleration in Relativistic Outflows*, Vlahakis, N. 2003, NewAR, 47, 701
10. *Relativistic Magnetohydrodynamics with Application to Gamma-Ray Burst Outflows. I. Theory and Semianalytic Trans-Alfvénic Solutions*, Vlahakis, N. & Königl, A. 2003, ApJ, 596, 1080
11. *Relativistic Magnetohydrodynamics with Application to Gamma-Ray Burst Outflows. II. Semianalytic Super-Alfvénic Solutions*, Vlahakis, N. & Königl, A. 2003, ApJ, 596, 1104
12. *A model for GRB jets*, Vlahakis, N. & Königl, A. 2003, Ap&SS, 287, 249
13. *Collimation of Astrophysical MHD Outflows*, Tsinganos, K., Vlahakis, N., Bogovalov, S., Sauty, C., Trussoni, E., & Lima, J. J. G. 2003, Ap&SS, 287, 103
14. *Ideal MHD Solution to the  $\sigma$  problem in Crab-like Pulsar Winds and General Asymptotic Analysis of Magnetized Outflows*, Vlahakis, N. 2004, ApJ, 600, 324
15. *Magnetic Driving of Relativistic Outflows in Active Galactic Nuclei. I. Interpretation of Parsec-Scale Accelerations*, Vlahakis, N. & Königl, A. 2004, ApJ, 605, 656
16. *Relativistic Parker winds with variable effective polytropic index*, Meliani, Z., Sauty, C., Tsinganos, K., & Vlahakis, N. 2004, A&A, 425, 773
17. *The efficiency of the magnetic acceleration in relativistic jets*, Vlahakis, N. 2004, Ap&SS, 293, 67
18. *Steady and Time-Dependent MHD Modelling of Jets*, Tsinganos, K., Vlahakis, N., Bogovalov, S. V., Sauty, C., & Trussoni, E. 2004, Ap&SS, 293, 55
19. *Magnetic fireball: The acceleration efficiency of hydromagnetic outflows in GRB sources*, Vlahakis, N. 2005, Nuovo Cimento C, 28, 393
20. *Nonradial and nonpolytropic astrophysical outflows. VIII. A GRMHD generalization for relativistic jets*, Meliani, Z., Sauty, C., Vlahakis, N., Tsinganos, K., & Trussoni, E. 2006, A&A, 447, 797
21. *Jet simulations extending radially self-similar magnetohydrodynamics models*, Gracia, J., Vlahakis, N., & Tsinganos, K. 2006, MNRAS, 367, 201
22. *Magnetized Outflows*, Vlahakis, N. 2006, Nuovo Cimento B, 121, 1145
23. *Radiation from internal shocks in magnetized supercritical flows*, Magkanari, M., Sapountzis, K., Mastichiadis, A., & Vlahakis, N. 2006, Nuovo Cimento B, 121, 1507
24. *Magnetic acceleration of relativistic active galactic nucleus jets*, Komissarov, S. S., Barkov, M. V., Vlahakis, N., & Königl, A. 2007, MNRAS, 380, 51

25. *Two-component jet simulations.*  
*I. Topological stability of analytical MHD outflow solutions,*  
Matsakos, T., Tsinganos, K., Vlahakis, N., Massaglia, S., Mignone, A., & Trussoni, E. 2008, A&A, 477, 521
26. *Resistive jet simulations extending radially self-similar magnetohydrodynamic models,*  
Čemeljić, M., Gracia, J., Vlahakis, N., & Tsinganos, K. 2008, MNRAS, 389, 1022
27. *Stability and structure of analytical MHD jet formation models with a finite outer disk radius,*  
Stute, M., Tsinganos, K., Vlahakis, N., Matsakos, T., & Gracia, J. 2008, A&A, 491, 339
28. *Magnetohydrodynamic modeling of relativistic outflows,*  
Vlahakis, N. 2008, International Journal of Modern Physics D, 17, 1661
29. *Synthetic synchrotron emission maps from MHD models for the jet of M87,*  
Gracia, J., Vlahakis, N., Agudo, I., Tsinganos, K., & Bogovalov, S. V. 2009, ApJ, 695, 503
30. *Magnetic acceleration of ultra-relativistic jets in gamma-ray burst sources,*  
Komissarov, S. S., Vlahakis, N., Königl, A., & Barkov, M. V. 2009, MNRAS, 394, 1182
31. *Two-component jet simulations.*  
*II. Combining analytical disk and stellar MHD outflow solutions,*  
Matsakos, T., Massaglia, S., Trussoni, E., Tsinganos, K., Vlahakis, N., Sauty, C., & Mignone, A. 2009, A&A, 502, 217
32. *Comparison of synthetic maps from truncated jet-formation models with YSO jet observations,*  
Stute, M., Gracia, J., Tsinganos, K., & Vlahakis, N. 2010, A&A, 516, A6
33. *Rarefaction acceleration of ultrarelativistic magnetized jets in gamma-ray burst sources,*  
Komissarov, S. S., Vlahakis, N., & Königl, A. 2010, MNRAS, 407, 17
34. *Relativistic expansion of a magnetized fluid,*  
Gourgouliatos, K. N., Vlahakis, N. 2010, Geophysical & Astrophysical Fluid Dynamics, 104, 431
35. *Design concepts for the Cherenkov Telescope Array CTA: an advanced facility for ground-based high-energy gamma-ray astronomy,*  
Actis, M. et al. 2011, Experimental Astronomy, 32, 193
36. *Velocity asymmetries in YSO jets. Intrinsic and extrinsic mechanisms,*  
Matsakos, T., Vlahakis, N., Tsinganos, K., Karampelas, K., Sauty, C., Cayatte, V., Matt, S. P., Massaglia, S., Trussoni, E., & Mignone, A. 2012, A&A, 545, A53
37. *Introducing the CTA concept,*  
Acharya, B. S. et al. 2013, Astroparticle Physics, 43, 3
38. *Rarefaction acceleration in magnetized gamma-ray burst jets,*  
Sapountzis, K., & Vlahakis, N. 2013, MNRAS, 434, 1779
39. *Two-component YSO jet models: from theory to synthetic observations,*  
Teşileanu, O., Matsakos, T., Massaglia, S., Mignone, A., Trussoni, E., Vlahakis, N., Tsinganos, K., Sauty, C., Cayatte, V., Stehlé, C., & Chièze, J.-P. 2014, A&A, 562, A117
40. *3D simulations of disc winds extending radially self-similar MHD models,*  
Stute, M., Gracia, J., Vlahakis, N., Tsinganos, K., Mignone, A., & Massaglia, S. 2014, MNRAS, 439, 3641
41. *Counter-rotation in relativistic magnetohydrodynamic jets,*  
Cayatte, V., Vlahakis, N., Matsakos, T., Lima, J. J. G., Tsinganos, K., & Sauty, C. 2014, ApJ, 788, L19

42. *Large resistivity in numerical simulations of radially self-similar outflows*, Čemeljić, M., Vlahakis, N., & Tsinganos, K. 2014, MNRAS, 442, 1133
43. *Rarefaction wave in relativistic steady magnetohydrodynamic flows*, Sapountzis, K., & Vlahakis, N. 2014, Physics of Plasmas, 21, 072124
44. *A radio jet drives a molecular & atomic gas outflow in multiple regions within one square kiloparsec of the nucleus of the nearby galaxy IC5063*, Dasyra, K. M., Bostrom, A. C., Combes, F., & Vlahakis, N. 2015, ApJ, 815, 34
45. *ALMA reveals optically thin, highly excited CO gas in the jet-driven winds of the galaxy IC5063*, Dasyra, K. M., Combes, F., Oosterloo, T., Oonk, J. B. R., Morganti, R., Salome, P., & Vlahakis, N. 2016, A&A, 595, L7
46. *Properties of the molecular gas in the fast outflow in the Seyfert galaxy IC 5063*, Oosterloo, T., Raymond Oonk, J. B., Morganti, R., Combes, F., Dasyra, K., Salomé, P., Vlahakis, N., & Tadhunter, C. 2017, A&A, 608, A38
47. *Nonradial and nonpolytropic astrophysical outflows. X. Relativistic MHD rotating spine jets in Kerr metric*, Chantry, L., Cayatte, V., Sauty, C., Vlahakis, N., & Tsinganos, K. 2018, A&A, 612, A63
48. *Phase-modulated X-ray Emission from Cepheids due to Pulsation-Driven Shocks*, Moschou, S.-P., Vlahakis, N., Drake, J. J., Evans, N. R., Neilson, H. R., Guzik, J. A., & ZuHone, J. 2020, ApJ, 900, 157
49. *A numerical study on laboratory plasma dynamics validated by low current x-pinch experiments*, Koundourakis, G., Skoulakis, A., Kaselouris, E., Fililis, I., Clark, E. L., Chatzakis, J., Bakarezos, M., Vlahakis, N., Papadogiannis, N. A., Dimitriou, V., & Tatarakis, M. 2020, Plasma Phys. & Control. Fusion, 62, 125012
50. *High performance simulations of a single X-pinch*, Skoulakis, A., Koundourakis, G., Ciardi, A., Kaselouris, E., Fililis, I., Chatzakis, J., Bakarezos, M., Vlahakis, N., Papadogiannis, N. A., Tatarakis, M., & Dimitriou, V. 2022, Plasma Phys. & Control. Fusion, 64, 025003
51. *Double flows anchored in a Kerr black hole horizon - I. Meridionally self-similar MHD models with loading terms*, Chantry, L., Cayatte, V. ; Sauty, C., Vlahakis, N., & Tsinganos, K. 2022, MNRAS, 515, 3796
52. *On the stability of relativistic two-component AGN jets*, Sinnis, C., Millas, D. & Vlahakis, N. 2023, MNRAS, 523, 6294
53. *Linear Stability Analysis of Relativistic Magnetized Jets: Methodology*, Vlahakis, N. 2023, Universe, 9,386
54. *Physics-informed neural networks for modeling astrophysical shocks*, Moschou, S. P., Hicks, E., Parekh, R. Y., Mathew, D., Majumdar, S., & Vlahakis, N. 2023, Mach. Learn.: Sci. Technol., 4, 035032
55. *Linear stability analysis of relativistic magnetized jets: The Kelvin-Helmholtz mode*, Sinnis, C. & Vlahakis, N. 2023, A&A, 680, A46
56. *Relativistic shocks in conductive media*, Loules, A. & Vlahakis, N. 2024, A&A, 681, A89
57. *Linear Stability Analysis of Relativistic Magnetized Jets: The Minimalist Approach*, Vlahakis, N. 2024, Universe, 10,183
58. *The Schwarzian Approach in Sturm-Liouville Problems*, Vlahakis, N. 2024, Symmetry, 16, 648

59. *The role of heating in the formation and the dynamics of YSO jets. I. A parametric study,*  
Meskini, C., Sauty, C., Marcowith, A., Vlahakis, N., Brunn, V. 2024, A&A, 686, A287
60. *A model for general relativistic magnetohydrodynamic spine jets,*  
Anastasiadis, Y. & Vlahakis, N. 2024, A&A, 688, A11
61. *Classical Waves and Instabilities Using the Minimalist Approach,*  
Vlahakis, N. 2025, 17, 150

συνεισφορά σε βιβλία  
(Invited Chapters  
in Special Volumes)

1. *On the Oscillatory Collimation of Astrophysical Jets,*  
Tsinganos, K. & Vlahakis, N. 1998, in *Astrophysical Jets: Open Problems*, S. Masiaglia and G. Bodo (eds.), Gordon and Breach Science Publishers, pp 43 - 51.
2. *MHD Modelling of Astrophysical Jets,*  
Tsinganos, K., Trussoni, E., Sauty, C., & Vlahakis, N. 2001, in *AGN in their Cosmic Environment*, B. Rocca-Volmerange and H. Sol (eds.), EAS Publication Series Vol. 1, pp 63 - 74.
3. *Output from MHD Models,*  
Vlahakis, N. 2010, in *Jets from Young Stars IV: From Models to Observations and Experiments*, P. J. V. Garcia and J. M. Ferreira (eds.), Lect. Notes Phys., 793, 51
4. *Theory of relativistic jets,*  
Vlahakis, N. 2015, in *The Formation and Disruption of Black Hole Jets*, I. Contopoulos, D. Gabuzda and N. Ky漏afis (eds.), Astrophysics and Space Science Library, 414, 177
5. *Studies of Relativistic Jets in Active Galactic Nuclei with SKA*, Agudo, I., Böttcher, M., Falcke, H., Georganopoulos, M., Ghisellini, G., Giovannini, G., Giroletti, M., Gómez, J. L., Gurvits, L., Laing, R., Lister, M., Martí, J.-M., Meyer, E. T., Mizuno, Y., O'Sullivan, S., Padovani, P., Paragi, Z., Perucho, M., Schleicher, D., Stawarz, L., Vlahakis, N., & Wardle, J. 2015, in *Advancing Astrophysics with the Square Kilometre Array (AASKA14)*, SKA Science Team (eds.), Proceedings of Science, id 93

σε πρακτικά συνεδρίων

1. *MHD disk-Wind Solutions Crossing all Singularities,*  
Trussoni, E., Vlahakis, N., Tsinganos, K., & Sauty, C. 2001 in *Particles and Fields in Radio Galaxies*, R. A. Laing and K. M. Blundell (eds.), ASP Conference Proceedings 250, 32.
2. *Systematic Construction of Exact Magnetohydrodynamic Models for Solar Coronal Structures and an Application to Modelling a Coronal Loop,*  
Petrie, G. J. D., Vlahakis, N., & Tsinganos, K. 2001, in *5th Hellenic Astronomical Conference*, published online <http://www.astro.auth.gr/elaset/helasmtg/2001/proceedings.htm>
3. *The Dynamics of Magnetized Outflows in GRBs,*  
Vlahakis, N. & Königl, A. 2003, in *Gamma-Ray Burst and Afterglow Astronomy 2001*, G. R. Ricker and R. K. Vanderspek (eds.), AIP Conference Proceedings 662, 166.
4. *Analytical Modeling of Hydromagnetic Jets in AGNs,*  
Vlahakis, N. & Königl, A. 2003, in *Active Galactic Nuclei: from Central Engine to Host Galaxy*, S. Collin, F. Combes, and I. Shlosman (eds.), ASP Conference Series 290, 219.

5. *The Dynamics of Magnetized Gamma-Ray Burst Outflows* , Vlahakis, N. 2004, in *Proceedings of the 6th Hellenic Astronomical Society Conference*, P. G. Laskarides (ed.), Editing Office of the University of Athens, 167.
6. *Study of Nonrelativistic and Relativistic MHD Jets* , Lazaridis, M., Sauty, C., Vlahakis, N., Tsinganos, K. 2004, in *Proceedings of the 6th Hellenic Astronomical Society Conference*, P. G. Laskarides (ed.), Editing Office of the University of Athens, 175.
7. *Relativistic Outflows in AGNs*, Vlahakis, N. & Königl, A. 2004, in *AGN Physics with the Sloan Digital Sky Survey*, G. T. Richards and P. B. Hall (eds.), ASP Conference Series 311, 151.
8. *Hydromagnetic Acceleration of GRB Outflows*, Vlahakis, N. & Königl, A. 2004, in *Third Rome Workshop on Gamma-Ray Bursts in the Afterglow Era*, M. Feroci, F. Frontera, N. Masetti, and L. Piro (eds.), ASP Conference Series 312, 464.
9. *Large-scale magnetic fields in GRB outflows: Acceleration, Collimation, and Neutron Decoupling*, Vlahakis, N. & Königl, A. 2004, in *Gamma-Ray Bursts: 30 years of discovery*, E. E. Fenimore and M. Galassi (eds.), AIP Conference Proceedings 727, 282
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