

Univ. Prof. Dr. Markus Arndt

Personal Information

Birth	14.09.1965, Unkel/Rh. (Germany)
Nationality	Germany
Marital status	Married, 2 children
Address	University of Vienna, Faculty of Physics, Boltzmanngasse 5, A-1090 Vienna
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ORCID	0000-0002-9487-4985

Career development

since 2008	Full Professor of Quantum Nanophysics at University of Vienna,
2004 - 2008	Professor of Quantum Nanophysics at University of Vienna,
2002	Docent / Ao. Univ. Prof. at University of Vienna (Habilitation)
1999 - 2002	Universitätsassistent at University of Vienna, with Anton Zeilinger.
1997 - 1998	Postdoc at University of Innsbruck, with Anton Zeilinger.
1995 - 1997	Postdoc at Ecole Normale Supérieure, Paris with Jean Dalibard
1994 - 1995	Postdoc at MPQ, Garching, with A. R. Weis and T. W. Hänsch
1991 - 1994	PhD (LMU, Munich) at MPQ, Garching: with A. R. Weis and T. W. Hänsch
1990 - 1991	Diploma Work at LMU Munich, with Herbert Walther

Professional activities

07/2020 – 9/2026	Scientific Director & V-DSPL, Vienna Doctoral School in Physics
10/2018 – 9/2022	Vice Dean, Faculty of Physics, University of Vienna
01/2020-12/2022	Coordinator, EU FET Open <i>SuperMaMa</i>
Since 9/2016	Speaker, Erwin Schrödinger Center for Quantum Science & Technology ESQ Austria
03/2016 – 06/2020	Speaker, Vienna Doctoral School in Physics
03/2013 – 02/2016	Coordinator, EU FET Open <i>NANOQUESTFIT</i>
2013 - 2015	PI & Founding member, Research Platform <i>QuNaBioS</i>
10/2012 – 09/2014	Dean, Faculty of Physics, University of Vienna
01/2007 – 09/2012	Speaker, Quantum optics, Q-nanophysics and Q-information
2006 - 2013	Speaker, Vienna FWF Graduate Program Complex Quantum Systems
2007 - 2011	Coordinator, ESF network: Molecule Interferometry & Metrology <i>MIME</i>
2008 - 2013	Member, Steering Committee to the ESF Network <i>Casimir</i>

Awards, Distinctions & Research Prizes

2020	Schrödinger Prize of the Austrian Academy of Sciences, ÖAW, with L. Erdős
2019	Robert-Wichard-Pohl Prize, German Physical Society, DPG
2018	Fetzer Pioneer Award, Fetzer Foundation
2014	Outstanding Referee for the journals of the American Physical Society (APS)
2013	Prize for Natural and Technical Sciences, City of Vienna
2012	ERC Advanced Grant, European Research Council
2008	Wittgenstein Prize, Ministry for Science and Research, BMWF & FWF
2006	Science Communication Award (3 rd), Austrian Science Fund, FWF
2001	START Prize, Ministry of Education, Science & Culture & FWF
2000	Fritz-Kohlrausch Prize, Austrian Physical Society, ÖPG
2000	Erich-Schmid-Prize, Austrian Acad. of Sciences, ÖAW, with G. Springholz

5 Distinguished fellowships and memberships

Since 2022	Member of the European Academy of Sciences and Arts
Since 2014	Corresponding Member, Austrian Academy of Sciences (ÖAW)
2008-2013	Member Young Curia, Austrian Academy of Sciences (ÖAW)
1996-1997	DFG research fellowship
1995-1996	Feodor-Lynen fellowship, Alexander von Humboldt foundation
1986-1991	Fellowship, Studienstiftung des deutschen Volkes

Research Interests

- **Universal matter-wave interferometry**
with atoms, clusters, tailored molecules, biomolecules and nanoparticles.
- **Quantum physics at the interface to the classical world:**
decoherence and interferometric tests of wave function collapse.
- **Quantum physics at the interface to chemistry:**
Quantum nanorulers to measure electric, magnetic, optical and structural properties of molecules.
- **Quantum physics at the interface to biology:**
Matter-wave experiments with vitamins, antibiotics and polypeptides.
- **Quantum physics at the interface to mass spectrometry technologies**
Quantum nanowire detectors for biomolecular beams
- **Quantum physics at the interface to optomechanics:**
Optical cooling of dielectric nanospheres in high-finesse microcavities as well as rotational cooling

A) Publications listed in the Science Citation Index

1. Sebastian Pedalino, Richard Ferstl, Bruno E. Ramírez-Galindo, Severin Sindelar, Stefan Gerlich and Markus Arndt
de Broglie and moiré metrology: From atoms to massive metal clusters
AVS Quantum Sci. 8, 013201, (2026), DOI: 10.1116/5.0301389
Scilight: 10.1063/10.0042205
2. Sebastian Pedalino, Bruno E. Ramírez-Galindo, Richard Ferstl, Klaus Hornberger, Markus Arndt and Stefan Gerlich
Probing quantum mechanics with nanoparticle matter-wave interferometry
Nature 649, 866-870 (2026), DOI: 10.1038/s41586-025-09917-9
Nature Podcast: <https://www.nature.com/articles/d41586-026-00227-2>
3. A. A. Sheekhoon, A. O. Haridy, S. Pedalino, V. V. Kresin
Photoionization of temperature-controlled nanoparticles in a beam: Accurate and efficient determination of ionization energies and work functions
Rev. Sci. Instrum. 96, 123705 (2025)
4. O. Rybakova, J. Reisinger, P. Rieser, P. Geyer, S. Gerlich, M. Arndt, A. Kumar, D. Häussinger, M. Mayor and V. Köhler
Photocleavable Porphyrin Derivatives for Quantum Optics
Helv. Chim. Acta (2025), e202500022, DOI: 10.1002/hlca.202500022
5. Y. Hua, D. Häussinger, M. Mayor, V. Köhler, M. Strauss, M. F. X. Mauser, T. Kistersitz, P. Geyer, M. Arndt
Neutralization of an Oxytocin Derivative by 355 nm Photocleavage in High Vacuum
Helv. Chim. Acta (2025), DOI: 10.1002/hlca.202400167
6. L. Martinetz, B. A. Stickler, K. Simonović, R. Ferstl, C. Brand, M. Arndt, and K. Hornberger
Probing molecular photophysics in a matter-wave interferometer
Phys. Rev. Research 6, 043270 (2024), DOI: 10.1103/PhysRevResearch.6.043270
7. M. Strauß, R. Gourgues, M. F. X. Mauser, L. Kulman, M. Castaneda, A. Fognini, A. Shayeghi, P. Geyer, M. Arndt
Superconducting Nanowire Detection of Neutral Atoms and Molecules via Their Internal and Kinetic Energy in the eV Range
Adv. Phys. Res. (2024), DOI: 10.1002/apxr.202400133
Adv. Phys. Res. Inside Front Cover & Featured as a recommended article
8. K. Simonović, R. Ferstl, A. Di Silvestro, M. Mayor, L. Martinetz, K. Hornberger, B. A. Stickler, C. Brand and M. Arndt
Diffraction of molecular matter-waves at deep-ultraviolet standing-light waves
Phys. Chem. Chem. Phys., (2024), DOI: 10.1039/D4CP03059A
9. P. Rieser, N. Rahaman, F. Donnerbauer, S. Putz, A. Shayeghi, S. Troyer, M. Arndt
An on-demand source of nanoparticles for optomechanics
Appl. Phys. Lett. 125, 094101 (2024), DOI: 10.1063/5.0221965

10. K. Simonović, R. Ferstl, A. Barlow, A. Shayeghi, C. Brand, M. Arndt
Diffraction of polar molecules at nanomasks with low charge density
Phys. Rev. Research **6**, 033109 (2024), DOI: 10.1103/PhysRevResearch.6.033109
11. F. Suzuki, S. A. Shah, D. A. R. Dalvit, and M. Arndt
Requirements for probing chiral Casimir-Polder forces in a molecular Talbot-Lau interferometer
Phys. Rev. Research **6**, 023145 (2024), DOI: 10.1103/PhysRevResearch.6.023145
12. M. Strauß, A. Shayeghi, M. Mauser, P. Geyer, T. Kustersitz, J. Salapa, O. Dobrovolskiy, S. Daly, J. Commandeur, Y. Hua, V. Köhler, M. Mayor, J. Benserhir, C. Bruschini, E. Charbon, M. Castaneda, M. Gevers, R. Gourgues, N. Kalhor, A. Fognini and M. Arndt
Highly sensitive single-molecule detection of macromolecule ion beams
Sci. Adv. **9**, 48, (2023), DOI: 10.1126/sciadv.adj2801
13. C. Brand, C. Knobloch, K. Simonović, and M. Arndt
Multi-Watt cavity for 266nm light in vacuum
Phys. Scr. **98** 085521 (2023), DOI: 10.1088/1402-4896/ace300
14. Y. Hua, M. Strauss, S. Fisher, M. F. X. Mauser, P. Manchet, M. Smacchia, P. Geyer, A. Shayeghi, M. Pfeiffer, T. H. Eggenweiler, S. Daly, J. Commandeur, M. Mayor, M. Arndt, T. Šolomek, V. Köhler
Giving the green light to photochemical uncaging of large biomolecules in high vacuum
JACS Au (2023), DOI: 10.1021/jacsau.3c00351
15. V. M. Bevez, M. Yu. Mikhailov, B. Budinská, S. Lamb-Camarena, S. O. Shpilinska, A. V. Chumak, M. Urbánek, M. Arndt, W. Lang, and O. V. Dobrovolskiy
Vortex counting and velocimetry for slitted superconducting thin strips
Phys. Rev. Applied **19**, 034098 (2023), DOI: 10.1103/PhysRevApplied.19.034098
16. R. Kaltenbaeck, M. Arndt, M. Aspelmeyer, P. F. Barker, A. Bassi, J. Bateman, A. Belenchia, J. Bergé, C. Braxmeier, S. Bose, B. Christophe, G.D. Cole, C. Curceanu, A. Datta, M. Debiossac, U. Delic, L. Diósi, A. A. Geraci, S. Gerlich, C. Guerlin, G. Hechenblaikner, A. Heidmann, S. Hermann, K. Hornberger, U. Johann, N. Kiesel, C. Lämmerzahl, T. W. LeBrun, G.J. Milburn, J. Millen, M. Mohageg, D.C. Moore, G.W. Morley, S. Nimmrichter, L. Novotny, D.K.L. Oi, M. Paternostro, C.J. Riedel, M. Rodrigues, L. Rondin, A. Roura, W.P. Schleich, T. Schuldt, B.A. Stickler, H. Ulbricht, C. Vogt, and L. Wörner
Research campaign: Macroscopic quantum resonators (MAQRO)
Quantum Sci. Technol. **8**, 014006 (2023), DOI: 10.1088/2058-9565/aca3cd
17. Y.Y. Fein, S. Pedalino, A. Shayeghi, F. Kiałka, S. Gerlich, and M. Arndt
Nanoscale magnetism probed in a matter-wave interferometer
Phys. Rev. Lett. **129**, 123001 (2022), DOI: 10.1103/PhysRevLett.129.123001
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18. S. Pedalino, T. de Sousa, Y.Y. Fein, S. Gerlich, and M. Arndt
Exploring metal nanoparticles for matter-wave interferometry
Phys. Rev. A **106**, 023312 (2022), DOI: 10.1103/PhysRevA.106.023312
19. *A roadmap for universal high-mass matter-wave interferometry*
F. Kiałka, Y. Y. Fein, S. Pedalino, S. Gerlich, and M. Arndt

AVS Quantum Sci. **4**, 020502 (2022), DOI: 10.1116/5.0080940

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20. High finesse microcavities in the optical telecom O-band
J. Fait, S. Putz, G. Wachter, J. Schalko, U. Schmid, M. Arndt, and M. Trupke
Appl. Phys. Lett. **119**, 221112 (2021), DOI: 10.1063/5.0066620

21. *Single-, double-, and triple-slit diffraction of molecular matter-waves*
C. Brand, S. Troyer, C. Knobloch, O. Cheshnovsky, and M. Arndt
Am. J. Phys. **89**, 1132 (2021), DOI: 10.1119/5.0058805
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22. W. C.-W. Huang, H. Batelaan, M. Arndt
Kapitza-Dirac Blockade: A Universal Tool for the Deterministic Preparation of Non-Gaussian Oscillator States
Phys. Rev. Lett. **126** (2021), DOI: 10.1103/PhysRevLett.126.253601
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23. C. Brand, M. R. A. Monazam, C. Mangler, Y. Lilach, O. Cheshnovsky, M. Arndt, J. Kotakoski
The morphology of doubly-clamped graphene nanoribbons
2D Materials **8**, 025035 (2021), DOI: 10.1088/2053-1583/abe952

24. C. Brand, F. Kialka, S. Troyer, C. Knobloch, K. Simonovic, B.A. Stickler, K. Hornberger, M. Arndt,
Bragg diffraction of large organic molecules
Phys. Rev. Lett. (2020), DOI: 10.1103/PhysRevLett.125.033604
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25. Y.Y. Fein, A. Shayeghi, F. Kialka, P. Geyer, S. Gerlich, M. Arndt,
Quantum-assisted diamagnetic deflection of molecules
Phys. Chem. Chem. Phys. (2020), DOI: 10.1039/d0cp02211j
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26. J. Schätti, V. Köhler, M. Mayor, Y.Y. Fein, P. Geyer, L. Mairhofer, S. Gerlich, M. Arndt,
Matter-wave interference and deflection of tripeptides decorated with fluorinated alkyl chains
J Mass Spectrom. (2020), DOI:10.1002/jms.4514

27. A. Shayeghi, P. Rieser, G. Richter, U. Sezer, J.H. Rodewald, P. Geyer, T.J. Martinez, M. Arndt,
Matter-wave interference of a native polypeptide
Nature Comm., **11**, 144 (2020), DOI: 10.1038/s41467-020-15280-2

28. C. Brand, K. Simonovic, F. Kialka, S. Troyer, P., Geyer, M. Arndt,
A fiber-based beam profiler for high-power laser beams in confined spaces and ultra-high vacuum
Optics Express (2020), DOI: 10.1364/OE.387650

29. Y. Y. Fein, F. Kialka, P. Geyer, S. Gerlich, M. Arndt,
Coriolis compensation via gravity in a matter-wave interferometer
New Journal of Physics (2020), DOI:10.1088/1367-2630/ab73c5

30. Y. Y. Fein, A. Shayeghi, L. Mairhofer, F. Kialka, P. Rieser, P. Geyer, S. Gerlich, M. Arndt, *Quantum-Assisted Measurement of Atomic Diamagnetism* **Phys. Review X** **10**, 011014(2020), DOI: 10.1103/PhysRevX.10.011014
31. Y. Y. Fein, P. Geyer, F. Kialka, S. Gerlich, M. Arndt, *Improved accuracy fullerene polarizability measurements in a long-baseline matter-wave interferometer* **Phys. Rev. Res.** **1**, 033158 (2019), DOI: 10.1103/PhysRevResearch.1.033158
32. Y. Y. Fein, P. Greyer, P. Zwick, F. Kialka, S. Pedalino, M. Mayor, S. Gerlich and M. Arndt, *Quantum Superposition of Molecules Beyond 25kDa*, **Nature Physics** (2019), DOI:10.1038/s41567-019-0663-9
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33. J. Schätti, M. Kriegleder, M. Debiossac, M. Kerschbaum, P. Geyer, M. Mayor, M. Arndt, V. Köhler, *Neutralization of insulin by photocleavage under high vacuum*, **Chem. Commun.** (2019), DOI: 10.1039/c9cc05712a
34. G. Wachter, S. Kuhn, S. Minniberger, C. Salter, P. Asenbaum, J. Millen, M. Schneider, J. Schalko, U. Schmid, A. Felgner, D. Hüser, M. Arndt, M. Trupke, *Silicon microcavity arrays with open access and a finesse of half a million*, **Light: Science & Applications** **8:37, 1-7** (2019), DOI: 10.1038/s41377-019-0145-y
35. C. Brand, M. Debiossac, T. Susi, F. Aguillon, J. Kotakoski, P. Roncin, M. Arndt *Coherent diffraction of hydrogen through the 246 pm lattice of graphene* **New J. Phys.** (2019), DOI: 10.1088/1367-2630/ab05ed
36. F. Kialka, B. Stickler, K. Hornberger, Y.Y. Fein, P. Geyer, L. Mairhofer, S. Gerlich, M. Arndt, *Concepts for long-baseline high-mass matter-wave interferometry* **Phys. Scr.** **94** (2019), DOI: 10.1088/1402-4896/aaf243
37. J. Schätti, P. Rieser, U. Sezer, G. Richter, P. Geyer, G. G. Rondina, D. Häussinger, M. Mayor, A. Shayeghi, V. Köhler, M. Arndt *Pushing the mass limit for intact launch and photoionization of large neutral biopolymers* **Commun. Chem.** **1**, 93 (2018), DOI: 10.1038/s42004-018-0095-y
38. B. A. Stickler, B. Papendell, S. Kuhn, B. Schränski, J. Millen, M. Arndt, K. Hornberger *Probing macroscopic quantum superpositions with nanorotors* **New J. Phys.** **20**, 122001 (2018), DOI: 10.1088/1367-2630/aaee4
39. C. Brand, B.A. Stickler, C. Knobloch, A. Shayeghi, K. Hornberger and M. Arndt *Conformer-selection by matter-wave interference* **Phys. Rev. Lett.** **121**, 173002 (2018), DOI: 10.1103/PhysRevLett.121.173002
40. L. Mairhofer, S. Eibenberger, A. Shayeghi and M. Arndt *A quantum ruler for magnetic deflectometry* **Entropy** **20**, 516 (2018), DOI: 10.3390/e20070516

41. M. Debiossac, J. Schätti, M. Kriegleder, P. Geyer, A. Shayeghi, M. Mayor, M. Arndt. and V. Köhler
Tailored photocleavable peptides: Fragmentation and neutralization pathways in high vacuum
Phys. Chem. Chem. Phys. **20**, 11412--11417 (2018), DOI: 10.1039/c8cp01058g
42. J. Rodewald, N. Dörre, A. Grimaldi, P. Geyer, L. Felix, M. Mayor, A. Shayeghi and M. Arndt
Isotope-selective high-order interferometry with large organic molecules in free fall
New J. Phys. **20**, 033016 (2018), DOI: 10.1088/1367-2630/aaade2
43. S. Kuhn, G. Wachter, F. Wieser, J. Millen, M. Schneider, J. Schalko, U. Schmid, M. Trupke and M. Arndt
Nanoparticle detection in an open-access silicon microcavity
Appl. Phys. Lett. **111**, 253107 (2017), DOI: 10.1063/1.5008492
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44. S. Kuhn, B. A. Stickler, A. Kosloff, F. Patolsky, K. Hornberger, M. Arndt and J. Millen
Optically driven ultra-stable nanomechanical rotor
Nature Comm. **8** (1) (2017), DOI: 10.1038/s41467-017-01902-9
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45. J. P. Cotter, C. Brand, C. Knobloch, Y. Lilach, O. Cheshnovsky and M. Arndt
In search of multipath interference using large molecules
Science Adv. **3**, e1602478 (2017), DOI: 10.1126/sciadv.1602478
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46. L. Mairhofer, S. Eibenberger, J. P. Cotter, M. Romirer, A. Shayeghi and M. Arndt
Quantum-assisted metrology of neutral vitamins in the gas-phase
Angew. Chem. Int. Ed. **56**, 6 (2017), DOI: 10.1002/ange.201704916
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47. L. Gallego, U. Sezer, M. Arndt and M. Mayor
Long-pulse laser launch and ionization of tailored large neutral silver nanoparticles with atomic mass assignment
Nanoscale **9**, 9175-9180 (2017); DOI: 10.1039/c7nr03297n
48. J. Schätti, U. Sezer, S. Pedalino, J. P. Cotter, M. Arndt*, M. Mayor and V. Köhler*
Tailoring the volatility and stability of oligopeptides
J. Mass Spectrom. **52**, 550-556(2017), DOI: 10.1002/jms.3959
49. J. Rodewald, P. Haslinger, N. Dörre, B.A. Stickler, A. Shayeghi, K. Hornberger and M. Arndt
New avenues for matter-wave-enhanced spectroscopy,
Appl. Phys. B **123**,3 (2017), DOI 10.1007/s00340-016-6573-y
50. U. Sezer, P. Geyer, M. Kriegleder, M. Debiossac, A. Shayeghi, M. Arndt, F. Lukas and M. Mayor
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51. S. Kuhn, A. Kosloff, B. A. Stickler, F. Patolsky, K. Hornberger, M. Arndt, and J. Millen
Full Rotational Control of Levitated Silicon Nanorods

- Optica 4, 356-360 (2017)**, DOI: doi.org/10.1364/OPTICA.4.000356
52. C. Knobloch, B. A. Stickler, C. Brand, M. Sclafani, Y. Lilach, T. Juffmann, O. Cheshnovsky, K. Hornberger and M. Arndt
On the role of the electric dipole moment in the diffraction of biomolecules at nanomechanical gratings
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53. B. A. Stickler, S. Nimmrichter, L. Martinetz, S. Kuhn, M. Arndt and K. Hornberger
Ro-Translational Cavity Cooling of Dielectric Rods and Disks
Phys. Rev. A 94, 033818, (2016), DOI: 10.1103/PhysRevA.94.033818
54. P. Geyer, U. Sezer, J. Rodewald, L. Mairhofer, N. Dörre, P. Haslinger, S. Eibenberger, C. Brand and M. Arndt
Perspectives for Quantum Interference with Biomolecules and Biomolecular Clusters
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55. W.P. Schleich, et al.
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56. C. Brand, M. Sclafani, C. Knobloch, Y. Lilach, T. Juffmann, J. Kotakoski, C. Mangler, A. Winter, A. Turchanin, J. Meyer, O. Cheshnovsky and M. Arndt
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58. C. Brand, J. Fiedler, T. Juffmann, M. Sclafani, C. Knobloch, S. Scheel, Y. Lilach, O. Cheshnovsky and M. Arndt,
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Cavity-assisted manipulation of freely rotating silicon nanorods in high vacuum
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66. N. Dörre, P. Haslinger, J. Rodewald, P. Geyer and M. Arndt,
A refined model for Talbot-Lau matter-wave optics with pulsed photo-depletion gratings
JOSA B **32**, 114–120 (2015), DOI: 10.1364/JOSAB.32.000114
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Photofragmentation beam splitters for matter-wave interferometry
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Testing macroscopic realism through high-mass interferometry.
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72. M. Arndt and K. Hornberger
Insight review: Testing the limits of quantum mechanical superpositions

- Nature Physics**10, 271-277 (2014), DOI: 10.1038/nphys2863
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