Mark Paul Panning

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Education

2004	UC Berkeley, Ph.D., Geophysics, Thesis Title: "Deep Earth Seismic Structure and Earthquake Source Processes from Long Period Waveform Modelling"
1999	Indiana University, B.S., Geological Sciences

Experience

2017-present	Research Scientist, Geophysics and Planetary Geosciences, Jet Propulsion Lab/California Institute of Technology
2008-2017	Assistant Professor, Dept. of Geological Sciences, University of Florida
2006-2008	Postdoctoral Fellow, Department of Geosciences, Princeton University
2004-2006	Postdoctoral Researcher, Berkeley Seismological Lab/Space Sciences Lab
1999-2004	Graduate Student Researcher/Instructor, University of California, Berkeley
1999	Research Assistant, Indiana University

Honors

2021	JPL Voyager Award, For leading the selected Farside Seismic Suite
2019	JPL Voyager Award, Outstanding science leadership in planetary seismometry
2018	JPL Voyager Award, For the selection of Dragonfly
2006	Princeton University Teaching Postdoctoral Fellowship in Science and Engineering, Council on Science & Technology
1999	Berkeley Fellowship, University of California, Berkeley
1998	Faculty Scholarship Award, Dept. of Geological Sciences, Indiana University

Services and Memberships

2017-2019	Chair, Lehmann Medal selection committee, American Geophysical Union
2015-2016	Member, Lehmann Medal selection committee, American Geophysical Union
2013-2014	President, American Geophysical Union SEDI focus group
2012-2014	Member, IRIS Global Seismic Network Standing Committee
2010-2012	Vice-Chair, American Geophysical Union SEDI focus group
2010-2014	Leadership Council, American Geophysical Union
2008-2010	Program Committee, American Geophysical Union Fall Meeting
2003-2018	Executive Committee, American Geophysical Union SEDI focus group (http://www.agu.org/focus_group/SEDI/index.html)

Peer Reviewed Publications

1. R. D. Lorenz, H. Shiraishi, **M. P. Panning**, and K. Sotzen, "Wind and surface roughness considerations for seismic instrumentation on a relocatable lander for Titan", *Plan. Space Sci*., **206**, 105320, doi: 10.1016/J.PSS.2021.105320, 2021.

2. A. G Marusiak, S. Vance, **M. P. Panning**, M. Behounkova, P. K. Byrne, G. Choblet, M. Melwani Daswani, K. Hughson, B. Journaux. A. H. Lobo, B. E. Schmidt, K. P. Sladkova, K. M. Soderlund, W. Song, O. Soucek, G. Steinbrügge, A. F. Thompson, and S. Wang, "Exploration of Icy Ocean Worlds Using Geophysical Approaches", *Plan. Sci. J*., **2**, 150, doi: 10.3847/PSJ/ac1272, 2021.

3. S. C. Stähler, A. Khan, W. B. Banerdt, P. Lognonné, D. Giardini, S. Ceylan, M. Drilleau, A. C. Duran, R. F. Garcia, Q. Huang, D. Kim, V. Lekic, H. Samuel, M. Schimmel, N. Schmerr, D. Sollberger, E. Stutzmann, Z. Xu, D. Antonangeli, C. Charalambous, P. M. Davis, J. C. E. Irving, T. Kawamura, M. Knapmeyer, R. Maguire, A. G. Marusiak, **M. P. Panning**, C. Perrin, A.-C. Plesa, A. Rivoldini, C. Schmelzbach, G. Zenhäusern, E. Beucler, J. F. Clinton, N. Dahmen, M. van Driel, T. Gudkova, A. Horleston, W. T. Pike, M. Plasman, and S. E. Smrekar, "Seismic detection of the martian core", *Science*, **373**, 443-448, doi: 10.1126/science.abi7730, 2021.

4. B. Knapmeyer-Endrun, **M. P. Panning**, F. Bissig, R. Joshi, A. Khan, D. Kim, V. Lekic, B. Tauzin, S. Tharimena, M. Plasman, N. Compaire, R. F. Garcia, L. Margerin, M. Schimmel, E. Stutzmann, N. Schmerr, E. Bozdag, A.-C. Plesa, M. A. Wieczorek, A. Broquet, D. Antonangeli, S. M. McLennan, H. Samuel, C. Michaut, L. Pan, S. E. Smrekar, C. L. Johnson, N. Brinkman, A. Mittelholz, A. Rivoldini, P. M. Davis, P. Lognonné, B. Pinot, J.-R. Scholz, S. C. Stähler, M. Knapmeyer, M. van Driel, D. Giardini, and W. B. Banerdt, "Thickness and structure of the martian crust from InSight seismic data", *Science*, **373**, 438-443, doi: 10.1126/science.abf8966, 2021.

5. A. Khan, S. Ceylan, M. van Driel, D. Giardini, P. Lognonné, H. Samuel, N. C. Schmerr, S. C. Stähler, A. C. Duran, Q. Huang, D. Kim, A. Broquet, C. Charalambous, J. F. Clinton, P. M. Davis, M. Drilleau, F. Karakostas, V. Lekic, S. M. McLennan, R. R. Maguire, C. Michaut, **M. P. Panning**, W. T. Pike, B. Pinot, M. Plasman, J.-R. Scholz, R. Widmer-Schnidrig, T. Spohn, S. E. Smrekar, and W. B. Banerdt, “Upper Mantle Structure of Mars from Seismic Data”, *Science*, **373**, 434-348, doi: 10.1126/science.abf2966, 2021.

6. M. Schimmel, E. Stutzmann, P. Lognonné, N. Compaire, P. Davis, M. Drilleau, R. F. Garcia, D. Kim, B. Knapmeyer-Endrun, V. Lekic, L. Margerin, **M. P. Panning**, N. Schmerr, J.-R. Scholz, A. Spiga, B. Tauzin, and W. B. Banerdt, "Seismic Noise Autocorrelations on Mars", *Earth Space Sci*., **8**, e2021EA001755, doi: 10.1029/2021EA001755, 2021.

7. N. Brinkman, S. C. Stähler, D. Giardini, C. Schmelzbach, A. Khan, A. Jacob, N. Fuji, C. Perrin, P. Lognonné, E. Beucler, M. Böse, S. Ceylan, C. Charalambous, J. F. Clinton, M. van Driel, F. Euchner, A. Horleston, T. Kawamura, B. Knapmeyer-Endrun, G. Mainsant, **M. P. Panning**, W. T. Pike, J.-R. Scholz, J. O. A. Robertsson, and W. B. Banerdt, "First Focal Mechanisms of Marsquakes", *J. Geophys. Res*., **126**, e2020JE006546, doi: 10.1029/2020JE006546, 2021.

8. S. L. Wang, **M. P. Panning**, S. D. Vance, and W. Song, "Underground Microseismic Event Monitoring and Localization within Sensor Networks", *Sensors*, **21**, 2830, doi: 10.3390/s21082830, 2021.

9. S. Kedar, **M. P. Panning**, S. E. Smrekar, S. C. Stähler, S. D. King, M. P. Golombek, M. Manga, B. R. Julian, B. Shiro, C. Perrin, J. A. Power, C. Michaut, S. Ceylan, D. Giardini, P. Lognonné, and W. B. Banerdt, "Analyzing Low Frequency Seismic Events at Cerberus Fossae as Long Period Volcanic Quakes", *J. Geophys. Res*., **126**, e2020JE006518, doi: 10.1029/2020JE006518, 2021.

10. H. T. Xu, C. Beghein, **M. P. Panning**, M. Drilleau, P. Lognonné, M. van Driel, S. Ceylan, M. Böse, N. Brinkman, J. F. Clinton, F. Euchner, D. Giardini, A. Horleston, T. Kawamura, B. Kenda, N. Murdoch, and S. C. Stähler, "Measuring Fundamental and Higher Mode Surface Wave Dispersion on Mars From Seismic Waveforms", *Earth Space Sci*., **8**, e2020EA001263, doi: 10.1029/2020EA001263, 2021.

11. E. Stutzmann, M. Schimmel, P. Lognonné, A. Horleston, S. Ceylan, M. van Driel, S. C. Stähler, W. B. Banerdt, M. Calvet, C. Charalambous, J. F. Clinton, M. Drilleau, L. Fayon, R. F. Garcia, D. Giardini, K. Hurst, A. Jacob, T. Kawamura, B. Kenda, L. Margerin, N. Murdoch, **M. P. Panning**, W. T. Pike, J.-R. Scholz, and A. Spiga, "The Polarization of Ambient Noise on Mars", *J. Geophys. Res*., **126**, e2020JE006545, doi: 10.1029/2020JE006545, 2021.

12. S. Ceylan, J. F. Clinton, D. Giardini, M. Böse, C. Charalambous, M. van Driel, A. Horleston, T. Kawamura, A. Khan, G. Orhand-Mainsant, J.-R. Scholz, S. C. Stähler, F. Euchner, W. B. Banerdt, P. Lognonné, D. Banfield, E. Beucler, R. F. Garcia, S. Kedar, **M. P. Panning**, W. T. Pike, S. E. Smrekar, A. Spiga, N. L. Dahmen, K. Hurst, A. E. Stott, R. D. Lorenz, M. Schimmel, E. Stutzmann, J. ten Pierick, V. Conejero, C. Pardo, and C. Perrin, "Companion guide to the marsquake catalog from InSight, Sols 0-478: Data content and non-seismic events", *Phys. Earth Planet. Int.,* **310**, 106597, doi: 10.1016/j.pepi.2020.106597, 2021.

13. J. F. Clinton, S. Ceylan, M. van Driel, D. Giardini, S. C. Stähler, M. Böse, C. Charalambous, N. L. Dahmen, A. Horleston, T. Kawamura, A. Khan, G. Orhand-Mainsant, J.-R. Scholz, F. Euchner, W. B. Banerdt, P. Lognonné, D. Banfield, E. Beucler, R. F. Garcia, S. Kedar, **M. P. Panning**, C. Perrin, W. T. Pike, S. E. Smrekar, A. Spiga, and A. E. Stott, "The Marsquake catalogue from InSight, sols 0-478", *Phys. Earth Planet. Int.*, **310**, 106595, doi: 10.1016/j.pepi.2020.106595, 2021.

14. M. Drilleau, E. Beucler, P. Lognonné, **M. P. Panning**, B. Knapmeyer-Endrun, W. B. Banerdt, C. Beghein, S. Ceylan, M. van Driel, R. Joshi, T. Kawamura, A. Khan, S. Menina, A. Rivoldini, H. Samuel, S. C. Stähler, H. T. Xu, M. Bonnin, J. Clinton, D. Giardini, B. Kenda, V. Lekic, A. Mocquet, N. Murdoch, M. Schimmel, S. E. Smrekar, E. Stutzmann, B. Tauzin, and S. Tharimena, "MSS/1: Single-Station and Single-Event Marsquake Inversion", *Earth Space Sci*., **7,** e2020EA001118, doi: 10.1029/2020EA001118, 2020.

15. **M. P. Panning**, W. T. Pike, P. Lognonné, W. B. Banerdt, N. Murdoch, D. Banfield, C. Charalambous, S. Kedar, R. D. Lorenz, A. G. Marusiak, J. B. McClean, C. Nunn, S. C. Stähler, A. E. Stott, and T. Warren, "On-deck seismology: Lessons from InSight for future planetary seismology", *J. Geophys. Res*., 2020, **125**, e2019JE006353, doi: 10.1029/2019JE006353, 2020.

16. T. A. Hurford, W. G. Henning, R. Maguire, V. Lekic, N. Schmerr, **M. P. Panning**, V. J. Bray, M. Manga, S. A. Kattenhorn, L. C. Quick, A. R. Rhoden, "Seismicity on tidally active solid-surface worlds", *Icarus*, **338**, doi: 10.1038/s41561-020-0544-y, 2020.

17. W. B. Banerdt, S. E. Smrekar, D. Banfield, D. Giardini, M. P. Golombek, C. L. Johnson, P. Lognonné, A. Spiga, T. Spohn, C. Perrin, S. C. Stähler, D. Antonangeli, S. Asmar, C. Beghein, N. Bowles, E. Bozdag, P. T. Chi, U. Christensen, J. F. Clinton, G. S. Collins, I. Daubar, V. Dehant, M. Drilleau, M. Fillingim, W. Folkner, R. F. Garcia, J. Garvin, J. Grant, M. Grott, J. Grygorczuk, T. Hudson, J. C. E. Irving, G. Kargl, T. Kawamura, S. Kedar, S. King, B. Knapmeyer-Endrun, M. Knapmeyer, M. Lemmon, R. D. Lorenz, J. N. Maki, L. Margerin, S. M. McLennan, C. Michaut, D. Mimoun, A. Mittelholz, A. Mocquet, P. Morgan, N. T. Mueller, N. Murdoch, S. Nagihara, C. Newman, F. Nimmo, **M. P. Panning**, W. T. Pike, A.-C. Plesa, S. Rodriguez, J. A. Rodriguez-Manfredi, C. T. Russell, N. Schmerr, M. Siegler, S. Stanley, E. Stutzmann, N. Teanby, J. Tromp, M. van Driel, N. Warner, R. C. Weber, and M. Wieczorek, "Initial results from the InSight mission on Mars", *Nature Geoscience*, **13**, 183-189, doi: 10.1038/s41561-020-0544-y, 2020.

18. D. Giardini, P. Lognonné, W. B. Banerdt, W. T. Pike, U. Christensen, S. Ceylan, J. F. Clinton, M. van Driel, S. C. Stähler, M. Böse, R. F. Garcia, A. Khan, **M. P. Panning**, C. Perrin, D. Banfield, E. Beucler, C. Charalambous, F. Euchner, A. Horleston, A. Jacob, T. Kawamura, S. Kedar, G. Mainsant, J.-R. Scholz, S. E. Smrekar, A. Spiga, C. Agard, D. Antonangeli, S. Barkaoui, E. Barrett, P. Combes, V. Conejero, I. Daubar, M. Drilleau, C. Ferrier, T. Gabsi, T. Gudkova, K. Hurst, F. Karakostas, S. King, M. Knapmeyer, B. Knapmeyer-Endrun, R. Llorca-Cejudo, A. Lucas, L. Luno, L. Margerin, J. B. McClean, D. Mimoun, N. Murdoch, F. Nimmo, M. Nonon, C. Pardo, A. Rivoldini, J. A. Rodriguez Manfredi, H. Samuel, M. Schimmel, A. E. Stott, E. Stutzmann, N. Teanby, T. Warren, R. C. Weber, M. Wieczorek, and C. Yana, "The seismicity of Mars", *Nature Geoscience*, **13**, 205-212, doi: 10.1038/s41561-020-0539-8, 2020.

19. P. Lognonné, W. B. Banerdt, W. T. Pike, D. Giardini, U. Christensen, R. F. Garcia, T. Kawamura, S. Kedar, B. Knapmeyer-Endrun, L. Margerin, F. Nimmo, **M. P. Panning**, B. Tauzin, J. R. Scholz, D. Antonangeli, S. Barkaoui, E. Beucler, F. Bissig, N. Brinkman, M. Calvet, S. Ceylan, C. Charalambous, P. Davis, M. van Driel, M. Drilleau, L. Fayon, R. Joshi, B. Kenda, A. Khan, M. Knapmeyer, V. Lekic, J. McClean, D. Mimoun, N. Murdoch, L. Pan, C. Perrin, B. Pinot, L. Pou, S. Menina, S. Rodriguez, C. Schmelzbach, N. Schmerr, D. Sollberger, A. Spiga, S. C. Stähler, A. Stott, E. Stutzmann, S. Tharimena, R. Widmer-Schnidrig, F. Andersson, V. Ansan, C. Beghein, M. Böse, E. Bozdag, J. F. Clinton, I. Daubar, P. Delage, N. Fuji, M. P. Golombek, M. Grott, A. Horleston, K. Hurst, J. Irving, A. Jacob, J. Knollenberg, S. Krasner, C. Krause, R. D. Lorenz, C. Michaut, R. Myhill, T. Nissen-Meyer, J. ten Pierick, A. C. Plesa, C. Quantin-Nataf, J. Robertsson, L. Rochas, M. Schimmel, S. Smrekar, T. Spohn, N. Teanby, J. Tromp, J. Vallade, N. Verdier, C. Vrettos, R. C. Weber, D. Banfield, E. Barrett, M. Bierwirth, S. Calcutt, N. Compaire, C. L. Johnson, D. Mance, F. Euchner, L. Kerjean, G. Mainsant, A. Mocquet, J. A. Rodriguez Manfredi, G. Pont, P. Laudet, T. Nebut, S. de Raucourt, O. Robert, C. T. Russell, A. Sylvestre-Baron, S. Tillier, T. Warren, M. Wieczorek, C. Yana, and P. Zweifel, "Constraints on the shallow elastic and anelastic structure of Mars from InSight seismic data", *Nature Geoscience*, **13**. 213-220, doi: 10.1038/s41561-020-0536-y, 2020.

20. S. L. Wang, F. Y. Li, **M. P. Panning**, S. Tharimena, S. D. Vance, and W.Z. Song, "Ambient Noise Tomography With Common Receiver Clusters in Distributed Sensor Networks", *IEEE Trans. Signal Info. Proc. Networks*, **6**, 656-666, doi: 10.1109/TSIPN.2020.3019328, 2020.

21. H. Samuel, P. Lognonné, **M. P. Panning**, and V. Lainey, "The rheology and thermal history of Mars revealed by the orbital evolution of Phobos", Nature, 569, 523-527, doi: 0.1038/s41586-019-1202-7, 2019.

22. M. van Driel, S. Ceylan, J. F. Clinton, D. Giardini, H. Alemany, A. Allam, D. Ambrois, J. Balestra, W. B. Banerdt, D. Becker, M. Böse, M. S. Boxberg, N. Brinkman, T. Casademont, J. Cheze, I. Daubar, A. Deschamps, F. Dethof, M. Ditz, M. Drilleau, D. Essing, F. Euchner, B. Fernando, R. Garcia, T. Garth, H. Godwin, M. P. Golombek, K. Grunert, C. Hadziioannou, C. Haindl, C. Hammer, I. Hochfeld, K. Hosseini, H. Hu, S. Kedar, B. Kenda, A. Khan, T. Kilchling, B. Knapmeyer-Endrun, A. Lamert, J. X. Li, P. Lognonne, S. Mader, L. Marten, F. Mehrkens, D. Mercerat, D. Mimoun, T. Moller, N. Murdoch, P. Neumann, R. Neurath, M. Paffrath, **M. P. Panning**, F. Peix, L. Perrin, L. Rolland, M. Schimmel, C. Schroer, A. Spiga, S. C. Stähler, R. Steinmann, E. Stutzmann, A. Szenicer, N. Trumpik, M. Tsekhmistrenko, C. Twardzik, R. C. Weber, P. Werdenbach-Jarklowski, S. Zhang, and Y. C. Zheng, "Preparing for InSight: Evaluation of the blind test for Martian seismicity", *Seism. Res. Lett*., **90**, 1518-1534, doi: 10.1785/0220180379, 2019.

23. S. C. Stähler, **M. P. Panning**, C. Hadziioannou, R. D. Lorenz, S. D. Vance, K. Klingbeil, and S. Kedar, "Seismic signal from waves on Titan's seas", *Earth Plan. Sci. Lett.*, **520**, 250-259, doi: 10.1016/j.epsl.2019.05.043, 2019.

24. S. R. James, H. A. Knox, R. E. Abbate, **M. P. Panning**, and E. J. Screaton, "Insights into permafrost and seasonal active-layer dynamics from ambient seismic noise monitoring", *J. Geophys. Res*., **124**, 1798-1816, doi: 10.1029/2019JF005051, 2019.

25. Bremner, P. M., **M. P. Panning**, R. M. Russo, V. Mocanu, A. C. Stanciu, M. Torpey, S. Hongsresawat, J. C. VanDecar, T. A. LaMaskin, and D. A. Foster, "Crustal shear wave velocity structure of Central Idaho and Eastern Oregon from ambient seismic noise: Results from the IDOR project", *J. Geophys. Res.*, **124**, 1601-1625. doi: 10.1029/2018JB016350, 2019.

26. Smrekar, S.E., P. Lognonné, T. Spohn, W. B. Banerdt, D. Breuer, U. Christensen, V. Dehant, M. Drilleau, W. Folkner, N. Fuji, R. F. Garcia, D. Giardini, M. Golombek, M. Grott, T. Gudkova, C. Johnson, A. Khan, B. Langlais, A. Mittelholz, A. Mocquet, R. Myhill, **M. P. Panning**, C. Perrin, W. T. Pike, A.-C. Plesa, A. Rivoldini, H. Samuel, S. C. Stähler, M. van Driel, T. Van Hoolst, O. Verhoeven, R. C. Weber, and M. Wieczorek, "Pre-mission InSights on the Interior of Mars", *Space Science Reviews*, **215**, doi: 10.1007/s11214-018-0563-9, 2019.

27. Lognonné, P., W.B. Banerdt, D. Giardini, W.T. Pike, U. Christensen, P. Laudet, S. de Raucourt, P. Zweifel, S. Calcutt, M. Bierwirth, K.J. Hurst, F. Ipelaan, J.W. Umland, R. Llorca-Cejudo, S. Larson, S. Kedar, B. Knapmeyer-Endrun, D. Mimoun, A. Mocquet, **M.P. Panning**, R.C. Weber, A. Sylveste-Baron, G. Pont, N. Verdier, L. Kerjean, L.J. Facto, V. Gharakanian, J.E. Feldman, T.L. Hoffman, D.B. Klein, K. Klein, N.P. Onufer, J. Paredes-Garcia, M.P. Petkov, J.R. Willis, S.E. Smrekar, M. Drilleau, T. Gabsi, T. Nebut, O. Robert, S. Tillier, C. Moreau, M. Parise, G. Aveni, S. Ben Charef, Y. Bennour, T. Camus, P.A. Dandonneau, C. Desfoux, B. Lecomte, O. Pot, P. Revuz, D. Mance, J. tenPierick, N.E. Bowles, C. Charalambous, A.K. Delahunty, J. Hurley, R. Irshad, H. Liu, A.G. Mukerherjee, I.M. Standley, A. E. Stott, J. Temple, T. Warren, M. Eberhardt, A. Kramer, W. Kühne, E.-P. Miettinen, M. Monecke, C. Aicardi, M. André, J. Baroukh, A. Borrien, A. Bouisset, P. Boutte, K. Brethomé, C. Brysbaert, T. Carlier, M. Deleuze, J.M. Desmarres, D. Dilhan, C. Doucet, D. Faye, N. Faye-Refalo, R. Gonzalez, C. Imbert, C. Larigauderie, E. Locatelli, L. Luno, S. Mehdi, J-R. Meyer, F. Mialhe, J.M. Mouret, M. Nonon, Y. Pahn, A. Paillet, P. Pasquier, G. Perez, R. Perez, L. Perrin, B. Pouilloux, A. Rosak, I. Savin de Larclause, J. Sicre, M.Sodki, N. Toulemont, B. Vella, C. Yana, F. Alibay, O. Avalos, M. Balzer, P. Bhandari, E. Blanco, B.D. Bone, J. Bousman, P. Bruneau, F.Calef, R.J. Calvet, S. D'Agostino, G. de los Santos, R. Deen, B. Denise, J. Ervin, N. Ferraro, H.E Gengl, F. Grinblat, D. Hernandez, M. Hetzel, M. Johnson, L. Khachikyan, J. Lin, S. Madzunkov, S. Marshall, L. Mikellides, E.A.Miller, W. Raff, J. Singer, C. Sunday, J. Villalvazo, M.C. Wallace, D. Banfield, J.A. Rodriguez-Manfredi, C.T. Russell, A. Trebi-Ollennu, J.N. Maki, E. Beucler, M. Böse, C. Bonjour, J.L. Berenguer, S. Ceylan, J. Clinton, V. Conajero, I. Daubar, V. Dehant, P. Delage, F. Euchner, I. Estève, L. Fayon, L. Ferraioli, C. Johnson, J. Gagnepain-Beyneix, M. Golombek, A. Khan, T. Kawamura, B. Kenda, P. Labrot, N. Murdoch, C. Pardo, C. Perrin, L. Pou, A. Sauron, D. Savoie, S. Stähler, E. Stutzman, N.A. Teanby, J. Tromp, M. van Driel, M. Wieczorek, R. Widmer-Schnidrig, and J. Wookey, "SEIS: The Seismic Experiment for Internal Structure of InSight", *Space Science Reviews*, **215**, doi: 10.1007/s11214-018-0574-6, 2019.

28. **Panning, M.P**. and S. Kedar, "Seismic response of the Mars Curiosity Rover: Implications for future planetary seismology", *Icarus,* **317**, 373-378, doi: 10.1016/j.icarus.2018.06.017, 2019.

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