Alan D. Rooney

Yale University
Department of Earth and Planetary Sciences
New Haven, CT, 06511
alan.rooney@yale.edu
https://people.earth.yale.edu/profile/alan-rooney/about

Current Position

Associate Professor, Yale University, Department Earth and Planetary Sciences 2025 –

Education and Professional Appointments

Yale University, Department of Earth and Planetary Sciences:	2017 – 2025
Harvard University, Department of Earth and Planetary Sciences:	2012 – 2016
Durham University, Department of Earth Sciences:	2011 – 2012
Durham University, Department of Earth Sciences, *PhD*:	2007 – 2011
Stockholm University, Department of Geology and Geochemistry, *MRes*:	2005 – 2006
University of Glasgow, Department of Earth Sciences, *BSc (Hons)*:	2000 – 2004

Research Interests

My research employs radiogenic isotope systems to better understand the interactions between tectonics, climatic processes and geochemical cycles on a range of spatial and temporal scales.

- Re-Os geochronology of sedimentary rocks and sulphide minerals
- Tracing crust-mantle processes using geochronology and isotope geochemistry
- Tracking paleo-ice sheet dynamics using radiogenic isotopes

Current Funding

NASA Exobiology Program: *Snowball Earth and the Rise of Animals,* Award Period 1/1/2025-1/1/2027

Yale Center for Natural Carbon Capture: *Calibrating Enhanced Rock Weathering with Os and Sr Isotopes*, Award Period: 7/1/2022-6/30/25, Lead PI

NSF funding

Collaborative Research: FRES: *Testing the Impact of Land Plants on the Earth System*, Award Period 9/1/2024-8/3/2029, Co-PI

Collaborative Research: FRES: *Co-evolution of Earth and Life across the Proterozoic-Phanerozoic transition: Integrated perspectives from outcrop and drill core*, Award Period: 9/1/2020-8/31/2025, Co-PI (lead at Yale)

Previous NSF Funding:

Collaborative Research: *Caught in the Act- The Petrology of Modern Lower-Crust Formation and Foundering in the North Andean Arc,* Award period: 9/1/2019–8/31/2022 (NCE-8/31/2023) Co-PI

Collaborative Research: *Developing a multi-proxy approach for reconstructing deep-time silicate weathering,* Award period: 9/1/2019–8/31/2021 – Lead PI

Peer-Reviewed Publications

(† represents student or postdoc author)

2025

43. Mughal, S., †Millikin, A.E.G., Zhang, T., †Gibson, T.M., **Rooney, A.D.,** Tosca, N.J., Bergmann, K.D., Strauss, J.V., Anderson, R.P., 2025, The Svanbergfjellet Formation: Viewing the nascent eukaryotic world. *Journal of the Geological Society 2025;182 (3)*

2024

42. †Millikin, A.E.G., Uveges, B., Izon, G.J., Bauer, A.M., Summons, R., Evans, D.A.D., **Rooney, A.D.,** 2024. A new Re-Os age constraint informs the dynamics of the Great Oxidation Event. *Geology* **52,** p. 857-862
41. Tassara, S., Ague, J.J., Keller, D.S., **Rooney, A.D.,** Wostbrok, J.A.G., Axler, J.A., Tardani, D., 2024*,* Osmium and oxygen isotope constraints on magma-crust interactions and the transport of copper at the roots of arcs. *Chemical Geology* **664**, p.122301
40. Cantine, M.D., **Rooney, A.D.,** Knoll, A.H., Gomez-Perez, I., Al Baloushi, B., Bergmann, K.D., 2024, Chronology of Ediacaran sedimentary and biogeochemical shifts along eastern Gondwanan margins. *Nature Communications Earth and Environment,* **5,** p. 520
39. Stockey, R..G., Cole, D.B., Farrell U.C., Agić H., Boag T.H., Brocks J.J., Canfield D.E., Cheng M., Crockford P.W., Cui H., Dahl T.W., Del Mouro L., Dewing K., Dornbos S.Q., Emmings J.F., Gaines, R.R., †Gibson, T.M., Gill, B.C., Gilleaudeau G.J., Goldberg K., Guilbaud R., Halverson G., Hammarlund E.U., Hantsoo K., Henderson M.A., Henderson C.M., Hodgskiss M.S.W., Jarrett A.J.M., Johnston D.T., Kabanov P., Kimmig J., Knoll A.H., Kunzmann M., LeRoy M.A., Li C., Loydell D.K., Macdonald F.A., Magnall J.M., Mills N.T., Och L.M., O'Connell B., Pagès A., Peters S.E., Porter S.M., Poulton S.W., Ritzer S.R., **Rooney A.D.,** Schoepfer S., Smith E.F., Strauss J.V., Uhlein G.J., White T., Wood R.A., Woltz C.R., Yurchenko I., Planavsky N.J., Sperling, E.A., 2024*,* Sustained increases in atmospheric oxygen and marine productivity in both the Neoproterozoic and Paleozoic eras. *Nature Geoscience* **17,** p. 667-674
38. **Rooney, A.D.,** Hnatyshin, D., †Toma, J., Saintilan, N.J., †Millikin, A.E.G., Selby, D., Creaser, R.A., 2024, Application of the ^{187}Re-^{187}Os geochronometer to crustal materials: systematics, methodology, data reporting and interpretation. *GSA Bulletin, Special Issue on Reporting and Interpreting Geochronology Data*, **136**, p. 4091-4129

2023

37. †Goss, G.A., **Rooney, A.D.,** 2023, Variations in Mid-Pleistocene glacial cycles: new insights from osmium isotopes. *Quaternary Science Reviews,* **321**, p. 108351 – **Invited Article**
36. Zhang, T., Keller, C.B., Hoggard, M.J., **Rooney, A.D.,** Halverson, G.P., Bergmann, K.D., Crowley, J.L., Strauss, J.V., 2023. A Bayesian Framework for Subsidence Modeling in Sedimentary Basins: A Case Study of the Tonian Akademikerbreen Group of Svalbard, Norway, *Earth and Planetary Science Letters*, **620**, p.118317
35. Busch, J. F., Boag, T. H., Sperling, E. A., **Rooney, A. D.,** Feng, X., Moynihan, D. P., & Strauss, J. V., 2023. Integrated Litho-, Chemo- and Sequence Stratigraphy of the Ediacaran Gametrail Formation Across a Shelf-Slope Transect in the Wernecke Mountains, Yukon, Canada. *American Journal of Science*, **323**, 4.
34. Jones, M.T., Stokke, E.W., **Rooney, A.D.,** Frieling, J., Pogge von Strandmann, P.A.W., Wilson, D.J., Svensen, H.H., Planke, S., Adatte, T., Thibault, N.R., Vickers, M.L., Mather, T.A., Tegner, C., Zuchuat, V., Schultz, B.P., 2023. Tracing North Atlantic volcanism and seaway connectivity across the Paleocene–Eocene Thermal Maximum (PETM), *Climate of the Past.* 19 (8), 1623-1652

33. Zieman, L., Ibanez-Mejia, M., **Rooney, A.D.,** Bloch, E., Pardo, N., Schoene, B., Szymanowski, D., 2023. To sink or not to sink: the thermal and density structure of the modern northern Andean arc constrained by xenolith petrology. *Geology, **51*** pp.586–590.
32. Planavsky, N. J., Asael, D., **Rooney, A. D.,** Robbins, L. J., Gill, B. C., Dehler, C. M., Cole, D. B., Porter, S. M., Love, G. D., Konhauser, K. O., & Reinhard, C. T., 2022. A sedimentary record of the evolution of the global marine phosphorus cycle. *Geobiology*, **21** pp. 168-174,

2022

31. Cawood, T.K., Moser, A., Borsook, A. and **Rooney, A.D.,** 2022. New constraints on the timing and character of the Laramide Orogeny and associated gold mineralization in SE California, USA. *GSA Bulletin*, **134** (11-12), pp. 3221-3241.
30. Tassara, S., **Rooney, A.D.,** Ague, J.J., Guido, D., Reich, M., Barra, F., Navarrete, C., 2022. Osmium isotopes fingerprint mantle controls on the genesis of an epithermal gold province, *Geology,* **50** (11), pp. 1291-1295
29. **Rooney, A.D.,** †Millikin, A.E.G., Ahlberg, P., Re-Os geochronology for the Cambrian SPICE event: Insights into euxinia and enhanced continental weathering from radiogenic isotopes. *Geology* **50** (6), pp.716-720
28. †Millikin, A.E.G., Strauss, J.V., Halverson, G.P., Bergmann, K., Tosca, N.J., **Rooney**, **A.D**., 2022, Calibrating the Russøya excursion in Svalbard, Norway, and implications for Neoproterozoic chronology. *Geology.* **50** (4): pp.506–510.

2021

27. †Gibson, T.M., †Millikin, A.E.G., Anderson, R.P., Myrow, P.M., **Rooney, A.D.,** 2021, Tonian deltaic sedimentation on the edge of Laurentia: the Veteranen Group of northeastern Spitsbergen, Svalbard, *Sedimentary Geology* pp.106011.
26. Yang, C., **Rooney, A.D**., Condon, D.J., Li, X-H., Grazhdankin, D.V., Bowyer, F.T., Hu, C., Macdonald, F.A., Zhu, M., 2021, The tempo of Ediacaran evolution. *Science Advances, 7*(45), p.eabi9643.
25. †Katchinoff, J.A.R., Syverson†., D.D., Evans† E.S.J.E., Planavsky, N.J., **Rooney, A.D.,** 2021, Seawater chemistry and hydrothermal controls on the Cenozoic osmium cycle. *Geophysical Research Letters.* p.e2021GL095558
24. Farrell, Ú. C., et al. 2021. The Sedimentary Geochemistry and Paleoenvironments Project. *Geobiology **19**, pp. 545-556.*.
23. Sperling, E.A. et al., 2021, A long-term record of early to mid-Paleozoic marine redox change: Science Advances, **v. 7**, p. eabf4382.
22. Busch, J.F., **Rooney, A.D**., Meyer, E.E., Town, C.F., Moynihan, D.P., Strauss, J.V. 2021. Late Neoproterozoic – early Paleozoic basin evolution in the Coal Creek inlier of Yukon, Canada: implications for the tectonic evolution of northwestern Laurentia. *Canadian Journal of Earth Sciences*. **58**(4): 355-377.
21. Syverson†, D.D., Katchinoff†, J.A.R., Yohe, L.R., Tutolo, B.M., Seyfried, W.E., **Rooney, A.D.,** 2021, Experimental partitioning of osmium between pyrite and fluid: Constraints on the mid-ocean ridge hydrothermal flux of osmium to seawater, *Geochimica et Cosmochimica Acta,* **293,** pp. 240-255.
20. Greenman, J.W., **Rooney, A.D.,** Patzke, M., Ielpi, A., Halverson, G.P., 2021 Re-Os geochronology highlights widespread latest Mesoproterozoic (ca. 1090-1050 Ma) cratonic basin development on northern Laurentia, *Geology* **49**, pp. 779-783.

2020

19. Rainbird, R.H., **Rooney**, **A.D.,** Creaser, R.A., Skulski, T., 2020, Shale and pyrite Re-Os ages from the Hornby Bay and Amundsen basins provide new chronological markers for Mesoproterozoic stratigraphic successions of northern Canada, *Earth and Planetary Science Letters*, **458**, p. 116492
18. **Rooney, A.D.,** Cantine, M.D., Bergman, K.D., Gomez-Perez, I., Al Baloushi, B., Boag, T.H., Busch, J.F., Sperling, E.A., Strauss, J.V., 2020, Calibrating the co-evolution of Ediacaran life and environment, *Proceedings of the National Academy of Sciences,* **117**, p. 16824-16830.
17. **Rooney, A.D.,** Chang, Y., Condon, D.J., Zhu., M and Macdonald, F.A., 2020, U-Pb and Re-Os geochronology tracks stratigraphic condensation in the Sturtian Snowball aftermath, *Geology,* **48**, p. 625-629.

2019

16. Penman, D.E., and **Rooney**, A.D., 2019, Coupled carbon and silica cycle perturbations during the Marinoan snowball Earth deglaciation: *Geology*, **47**, p. 317–320.

2018

15. Li, Y†., Zhang, S., Hobbs, R., Caiado, C., Sproson, A.D., Selby, D. and **Rooney, A.D**., 2018. Monte Carlo sampling for error propagation in linear regression and applications in isochron geochronology. *Science Bulletin*. **64**, p. 189-197.
14. **Rooney, A.D.,** Austermann, J., Smith, E.F., Li, Y†., Selby, D., Dehler, C.M., Schmitz, M.D., Karlstrom, K.E., Macdonald, F.A., 2018, Coupled Re-Os and U-Pb geochronology of the Tonian Chuar Group, Grand Canyon. *Geological Society of America Bulletin*, **130**, p. 1085-1098.

2017

13. Cohen, P.A., Strauss, J.V., **Rooney, A.D.,** Sharma, M., Tosca, N., 2017, Controlled hydroxyapatite biomineralization in an ~810 million-year-old unicellular eukaryote. *Science Advances*, **3**, e1700095

2016–2010

12. **Rooney, A.D.,** Selby, D., Lloyd, J.M., Roberts, D.H., Lückge, A., Sageman, B.B., and Prouty, N.G., 2016, Tracking millennial-scale Holocene glacial advance and retreat using Osmium isotopes: Insights from the Greenland Ice Sheet: *Quaternary Science Reviews*, **138**, p. 49-61.
11. Bold, U., Smith, E.F., **Rooney, A.D.,** Ramezani, J., Buchwaldt, R., Crowley, J.L., Schrag, D.P., Macdonald, F.A., 2016. Neoproterozoic stratigraphy of Zavkhan terrane of Mongolia: the backbone for Cryogenian and Early Ediacaran chemostratigraphic records. *American Journal of Science*, **316**, p. 1-63.
10. **Rooney, A.D.,** Strauss, J.V., Brandon, A.D., Macdonald, F.A., 2015. A Cryogenian Chronology: Two long-lasting, synchronous Neoproterozoic glaciations, *Geology*, **43**, p. 459-462.
9. Swanson-Hysell, N.L., Maloof, A.C., Condon, D.J., Jenkin, R.T.G., Alene, M., Tremblay, M.M., Tesema, T., **Rooney, A.D.,** Haileab, B., 2015. Age, synchroneity and duration of the Neoproterozoic Bitter Springs Stage constrained by the Tambien Group of Ethiopia, *Geology*, **43, p.** 323-326.
8. Bertoni, M.E., **Rooney, A.D.,** Selby, D., Alkmim, F.F., Le Heron, D.P., 2014. Neoproterozoic Re-Os systematics of organic-rich rocks in the São Francisco Basin, Brazil and implications for hydrocarbon exploration*. Precambrian Research*, **255**, p. 355-366.

7. Strauss, J.V., **Rooney, A.D.,** Macdonald, F.A., Brandon, A.D., Knoll, A.H., 2014. 740 Ma vase-shaped microfossils from the Yukon Territory: Implications for Neoproterozoic chronology and biostratigraphy. *Geology*, **42,** p. 659-662.
6. Sperling, E.A., **Rooney, A.D.,** Hays, L., Sergeev, V.N., Sergeeva, N.D., Pearson, A., Selby, D., Johnston, D.T., Knoll, A.H. 2014. Redox heterogeneity of subsurface waters in the Mesoproterozoic. *Geobiology*, doi: 10.1111/gbi.12091
5. **Rooney, A.D.,** Macdonald, F.A., Strauss, J.V., Dudás, F. Ö., Hallmann, C., Selby, D., 2014. Re-Os Geochronology and Coupled Os-Sr Isotope Constraints on the Sturtian Snowball Earth. *Proceedings of the National Academy of Sciences*, **111**, p. 51-56.
4. Cumming, V.M., Poulton, S.W., **Rooney, A.D.,** Selby, D., 2013. Anoxia in the Terrestrial Environment During the Late Mesoproterozoic. *Geology*, **41**, p. 583-586.
3. **Rooney, A.D.,** Selby, D., Lewan, M., Lillis, P.G., Houzay, J-P., 2012. Re and Os complexation and systematics in organic-rich sediments: implications for Re-Os fractionation from hydrous pyrolysis. *Geochimica et Cosmochimica Acta*, **77**, p. 275-291.
2. **Rooney, A.D.,** Chew, D.M., Selby, D. 2011. Re-Os geochronology of the Neoproterozoic-Cambrian Dalradian Supergroup of Scotland and Ireland: Implications for Neoproterozoic stratigraphy, glaciations and Re-Os systematics. *Precambrian Research*, **185**, p. 202-214.
1. **Rooney, A.D.,** Selby, D., Houzay, J-P., Renne, P.R. 2010. Re-Os geochronology of a Mesoproterozoic sedimentary succession, Taoudeni basin, Mauritania: Implications for basin-wide correlations and Re-Os organic-rich sediments systematics. *Earth and Planetary Science Letters*, **289**, p. 486-496.

Book Chapters

2. Schmitz, M.D., Singer, B.S., **Rooney, A.D.,** Radiogenic Isotope Geochronology. In: *The Geologic Time Scale 2020*, Gradstein, F.M., Ogg, J.G., Schmitz, M.D., Ogg, G.M., (Eds.) Elsevier, **v.1**, pp. 193-209.
1. Selby, D., Cumming, V.M., **Rooney, A.D.,** Finlay, A.J., 2013, Hydrocarbons/Rhenium-Osmium (Re-Os): Organic-rich sedimentary rocks. In: Rink, W.J., Thompson, J.W., (Eds.), Encyclopedia of Scientific Dating Methods. Springer, pp. 330-334.

Public Science Contributions

- Geological Society of Australia Victoria Division *Selwyn Conference* Public Lecture 2023
- Sedimentary Geochemistry and Paleoenvironments Project Proxy Primer Lecture 2021
  https://www.youtube.com/watch?v=pFRMgyohXbo
- Yale University Climate Day, Peabody Museum 2019