Devin Lee Schrader

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I am the Deputy Director of the Buseck Center for Meteorite Studies and an Associate Research Professor in the School of Earth and Space Exploration at Arizona State University. My research concerns the study of primitive meteorites that remain relatively unaltered since their formation in the early Solar System, as well meteorites that were thermally and aqueously altered on their parent asteroid. I utilize petrographic, compositional, thermodynamic, and isotopic data to constrain the pre-accretionary formation conditions and secondary thermal and aqueous alteration processes of small bodies in the early Solar System.

Education

2007 – 2012: Ph.D. in Planetary Science. University of Arizona, Lunar and Planetary Laboratory, Tucson, AZ.
Thesis: The Formation and Alteration of the Renazzo-Like Carbonaceous Chondrites
Advisors**:** Dante S. Lauretta and Harold C. Connolly Jr.

2002 – 2006: B.S. in Astronomy, B.S. in Physics. University of Arizona, Department of Astronomy and Department of Physics, Tucson, AZ.

Current Appointments

August 2022 – present: Deputy Director, Buseck Center for Meteorite Studies, Arizona State University.

July 2020 – present: Associate Research Professor, School of Earth and Space Exploration, Arizona State University.

Past Appointments

July 2019 – August 2022: Interim Director, Buseck Center for Meteorite Studies, Arizona State University.

May 2015 – June 2020: Assistant Research Professor, School of Earth and Space Exploration, Arizona State University.

2015 – June 2019: Assistant Director, Center for Meteorite Studies, Arizona State University.

2013 – 2015: Postdoctoral Fellow, Smithsonian Institution, National Museum of Natural History, Department of Mineral Sciences, Washington, DC.
Advisor**:** Timothy J. McCoy

2012 – 2013: Postdoctoral Fellow, Hawai'i Institute of Geophysics and Planetology, University of Hawai'i at Mānoa, Honolulu, HI.
Advisor**:** Alexander N. Krot

2012: Research/Laboratory Assistant, Lunar and Planetary Laboratory, Department of Planetary Sciences, University of Arizona, Tucson, AZ.
Advisor**:** Dante S. Lauretta

2006: REU Intern, American Museum of Natural History, New York City, NY. Advisor**:** Harold C. Connolly Jr.

2004 – 2005: Electron Microprobe Mineral Analysis, RRUFF Project, Department of Geosciences, University of Arizona, Tucson, AZ.
Advisor**:** Robert T. Downs

2003 – 2004: Intern, UA/NASA Space Grant Undergraduate Research Program, Lunar and Planetary Laboratory, Department of Planetary Sciences, University of Arizona, Tucson, AZ.
Advisor**:** David A. Kring

Professional Experience

2013 – 2022: Science Team Collaborator, Carbonaceous Meteorites, OSIRIS-REx Asteroid Sample Return Mission (NASA).

2008 – 2009: Visiting Research Student, Open University, UK.

Laboratory Experience

Electron probe microanalysis (Cameca SX-50 and SX-100, and JEOL JXA-8500F Hyperprobe and 8900 Superprobe), scanning electron microscopy, optical microscopy, *in situ* secondary ion mass spectrometry (Al/Mg and O-isotopes; Cameca ims-1280), focused ion beam techniques, gas mixing lines, quadrupole mass spectrometry, high temperature horizontal tube furnace, and bulk sample O-isotope mass spectrometry via laser fluorination.

Teaching Experience

Courses Taught

LIA 194-85251. Discovery Seminar, *Rocks from Space: History and Pop Culture*, (co-taught with Dr. Jemma Davidson) Fall 2023.

LIA 194-27759. Discovery Seminar, *Rocks from Space: History and Pop Culture*, (co-taught with Dr. Jemma Davidson) Spring 2023.

SES 591/594. *Advances in Solar System Exploration with Sample Return Missions*. Two guest lectures: 'The OSIRIS-REx Asteroid Sample Return Mission' and Discussion (Dr. Meenakshi Wadhwa, ASU, Spring 2023).

GLG 485. *Meteorites and Cosmochemistry*. Two guest lectures: 'Meteorite Classification', and 'Iron Meteorites' (Dr. Larry Nittler, ASU, Spring 2023)

SES 499. *Individualized Instruction.* Independent study in meteorite research, Fall 2021.

SES 520. *Exploring SESE Research.* Guest lecture on sample return missions, Fall 2021.

SES 191. *Exploring SESE.* Guest lecture on the interdisciplinary nature of meteoritics, Fall 2021.

GLG 485. *Meteorites and Cosmochemistry*. Two guest lectures: 'Meteorite Classification', and 'OSIRIS-REx' (Dr. Meenakshi Wadhwa, ASU, Spring 2021)

GLG 485. *Meteorites and Cosmochemistry*. Three guest lectures: 'Meteorites', 'Classification', and 'OSIRIS-REx' (Dr. Meenakshi Wadhwa, ASU, Fall 2018)
ASTR 105. *The* Sky. One guest lecture: 'Chondrules' (Dr. Thomas Burbine, Mount Holyoke College, Spring 2018)
SES 494/591. *Sample Return Missions.* Three guest lectures on 'OSIRIS-REx', 'Hayabusa', and 'Hayabusa2' (Dr. Meenakshi Wadhwa, ASU, Spring 2018)
GLG 485. *Meteorites and Cosmochemistry*. One guest lecture: 'OSIRIS-REx and Asteroid Sample Return Missions' (Dr. Meenakshi Wadhwa, ASU, Fall 2016)
PTYS 214. *Astrobiology: A Planetary Perspective*. Graduate teaching assistant, presented six lectures: 'Asteroids'; 'Comets and Organic Matter'; 'Extremophiles'; 'Mars Exploration'; 'Extra Solar Planets – Discovery and ground based observations'; 'Extra Solar Planets – Space based observations and the future'; and a final exam review (Elisabetta Pierazzo, UA, Spring 2011)
NATS 102. *The Universe and Humanity: Origin and Destiny*. Graduate teaching assistant, presented one lecture: 'Meteorites' (Dr. Tim Swindle, UA, Fall 2009)

Applications and Analysis Seminars

Silicate Geothermometers in Meteorites: Best Practices and Applications (ASU/CMS, Fall 2016)
Formation and Geothermometry of Sulfides in Meteorites (ASU/CMS, Spring 2016)
Thermal Metamorphism in Chondritic Meteorites (ASU/CMS, Fall 2015)

Undergraduate Student Mentoring

Xeynab Mouti (Fall 2021, Independent Study; 2020–2021, ASU/NASA Space Grant; 2019–2020, Barrett College Fellows program)
Jasmine Nguyen (2019–2020, Barrett College Fellows program)
Harold Carrigan (2017–2018, Barrett Fellows @ CLAS Centers program)
David Ackerman (2017–2018, Barrett Fellows @ CLAS Centers program)

NASA Psyche Mission Student Senior Capstone Project Co-Lead, Subject Matter Expert: Iron Meteorite Database (2018–2020)
NASA Psyche Mission Student Senior Capstone Project Mentor, Subject Matter Expert: Meteorite Imaging Project (2017–2019)

Graduate Student Mentoring

Andrea Distel (2022–date: PhD Student in SESE. Thesis Committee Member, second project advisor)
Elliot Mares-Manton (2022–date: MS Student in SESE. Thesis Committee Member)
Brendan Chapman (2022–date: MS Student in SESE. Thesis Committee Member)
Nicole Phelan (2022–date: MS Student in SESE. Thesis Committee Member)
Ashley Herbst (2020–2021: PhD Student in SESE. Thesis Committee Member)
Soumya Ray (2021: PhD Student in SESE. Thesis Committee Member)
Zachary Torrano (2019–2020: PhD Student in SESE. Thesis Committee Member)
Emilie Dunham (2019: PhD Student in SESE. Thesis Committee Member)
Alexandra Perez (2016–2018; Master's Student in SESE. Co-advisor)

Honors and Awards

CAS-NAS New Leaders in Space Science (an international collaboration between The National Space Science Center of the Chinese Academy of Sciences [CAS] and the Space Studies Board of U.S. National Academies of Sciences [NAS], Engineering, and Medicine) (2019)
NASA Group Achievement Award, OSIRIS-REx Mission Team (2017)
Asteroid 117581 Devinschrader (formerly 2005 EG_{37}) named for contributions to Planetary Science (2017)
2011 Nininger Award, Honorable Mention (2012)
UA College of Science Galileo Circle Scholar (2012)
UA-LPL Graduate Teaching Assistant Excellence Award (Spring 2011)
Eagle Scout Rank, Boy Scouts of America (2002)

Scholarships and Travel Grants

74th Meeting of the Meteoritical Society Travel Grant (2011)
UA Graduate and Professional Student Council Travel Grant (2011)
UH-NAI 2011 Astrobiology Winter School Scholarship (2011)
CO-I, NASA Astrobiology Institute 2009 Director's Discretionary Fund (2009–2010)
PI: Dante Lauretta
72nd Meeting of the Meteoritical Society Travel Grant (2009)
Carson Graduate Fellowship of Planetary Science (2007–2009)
Kobe International School of Planetary Sciences Scholarship (2007)
Angelos C. Langadas Scholarship (2006)
Planetary Society Scholarship (2003–2005)
UA Achievement Award Scholarship (2002–2006)
President's Award for Excellence Scholarship (2002–2006)
Huachuca Gem and Mineral Club Scholarship (2002–2006)

Professional Service/Activities

Outreach and Public Talks

Meteorite Vault Tours (numerous, 2015 – present)
Earth and Space Exploration Day, SESE, ASU (Oct. 2023, Oct. 2022, Oct. 2019, Oct. 2018, Nov. 2017, Nov. 2016, Nov. 2015)
Open Door, SESE, ASU (Feb. 2023, Feb. 2020, Feb. 2019, Feb. 2018)
Virtual Earth and Space Exploration Day, SESE, ASU (Oct. 2020, Nov. 2021)
Astronomy Night, Poston Jr. High School, Mesa, AZ (Nov. 2019, Nov. 2016, Dec. 2015)
Conducted numerous tours, Meteorite Gallery and Meteorite Vault, CMS (2015–present)
Managed multiple social media platforms for the ASU Center for Meteorite Studies (May 2015–present)
DISCOVERosity Zone Camp, Ahwatukee, Arizona (July 2019)
Astronomy Night, Santan Jr. High School, Chandler, AZ (Feb. 2018)
Astronomy Night, Carson Jr. High School, Mesa, AZ (Feb. 2018, Feb. 2017, Feb. 2016)
ASU Homecoming, Tempe, AZ (Oct. 2017, Oct. 2016, Nov. 2015)
Intel 'shift 7' Employee Event, Chandler, AZ (June, 2017)

Phoenix ComiCon, Phoenix, AZ (May 2017, June 2016)
Astronomy Night, Arete Preparatory Academy, Gilbert, AZ (Apr. 2017, Apr. 2016)
Night of the Open Door, SESE, ASU (Feb. 2017, Feb. 2016)
31st ASU at the Capital Day (Feb. 2017) Meet the Scientist, Arizona Museum of Natural History, Mesa, AZ (Oct. 2016)
Daisy Mountain Gem and Mineral Club, Anthem, AZ (Oct. 2015)
Smithsonian Science How Webcast: Astrogeology – Meteorites and Spacecraft Missions, Panelist (2015)
Air & Scare Family Night, Udvar-Hazy Center, National Air and Space Museum (2014)
Meteorites: Time capsules from the formation of the Solar System, Q?rius: The Expert is In, National Museum of Natural History (2014)
Discover the Moon Day!, National Air and Space Museum (2014)
OSIRIS-REx Asteroid Sample Return Mission, Tucson Festival of Books (2012)
Lunar and Planetary Laboratory 50th Anniversary Arizona Meteorite Exhibition (2010)

Intramural – ASU/SESE/CMS

Graduate Student Oversight Committee (2021–present)
INCLUDES (INCLUsion DEpartmental) Training Program (facilitator training to become a to become a trained ADVANCEGeo facilitator) (2021–2022)
ASU's Space Cohort (2020)
CLAS Special Research Committee meetings (2017–present)
Nininger Meteorite Award Organizer, CMS (2015–present)
Nininger Student Travel Award Organizer and Reviewer, SESE (2016–present)
Development Success Seminars, ASU (2015–present)
CLAS Communicators, ASU (2015–present)
ASU/NASA Space Grant Steering Committee (2017–2022)

Extramural – Committees

Extraterrestrial Materials Analysis Group (ExMAG) Meteorite Subcommittee, Chair (2024 – present)
ADVANCEGeo trained facilitator (August 2022–present)
ExMAG Astromaterials Data Management and Archiving Working Group, Member (2023–present)
Meteoritical Society Nomenclature Committee, Editor (Jan. 2022–present)
Meteoritical Society Nomenclature Committee, Member (Jan. 2020–Dec. 2021)
Meteoritical Society Membership Committee, Member (Jan. 2017–Dec. 2019)
Meteorite Working Group (MWG, NASA), Member (Jan. 2016–Dec. 2018)
Curation and Analysis Planning Team for Extraterrestrial Materials (CAPTEM, NASA), Member (Jan. 2016–Dec. 2018)

Extramural – Review Panels

JAXA, Proposal Panel, External Reviewer (1 panel)
NASA, Proposal Panel, Group Chief or Panel Lead (3 panels)
NASA, Proposal Panel, Panelist (3 panels)
JAXA, Proposal Panel, Panel Member (1 panel)
NASA, Proposal Panel, External Reviewer (10 panels)
MRC/UKRI, UK, External Reviewer (1 panel)

University of Sharjah Research Fund, UAE, External Reviewer (1 panel)
Graduate and Professional Student Council, UA, Travel Grant Judge (1 panel)

Extramural – Journal Peer Review

Geochimica et Cosmochimica Acta (27)
Meteoritics & Planetary Science (21)
Lithos (1)
Nature Communications (2)
Earth and Planetary Science Letters (5)
Geochemistry (1)
Nature Geoscience (1)
Polar Science (1)
Science Advances (1)

Extramural – Book Peer Review

Book proposal for *Elsevier* (2016, 2020)
Chondrules (Cambridge University Press), book chapter review (1)

Extramural – Conference Sessions Chaired

Lunar and Planetary Science Conference – Dwornik Judge (2018, 2013)
Lunar and Planetary Science Conference – Session Chair (2015, 2013)
Meeting of the Meteoritical Society – Session Chair (2011)

Invited Talks

Department of Earth, Planetary, and Space Sciences, University of California, Los Angeles, CA, USA (Nov. 2022)
Students for the Exploration and Development of Space, ASU (March, 2022)
Lunar and Planetary Laboratory, University of Arizona, AZ, USA (Aug. 2021– virtual due to COVID-19)
Open University, Milton Keynes, UK (June 2021– virtual due to COVID-19)
Natural History Museum, London, UK (Feb. 2021– virtual due to COVID-19)
Arizona Museum of Natural History, AZ (Sept. 2020 – virtual due to COVID-19)
SESE Summer Colloquia Series, School of Earth and Space Exploration, Arizona State University, AZ (July 2020 – virtual due to COVID-19)
CAS-NAS 10th Forum for New Leaders in Space Science, Washington, DC (Oct. 2019)
NASA Johnson Space Center, TX, USA (Sept. 2019)
CAS-NAS 9th Forum for New Leaders in Space Science, Beijing, China (May 2019)
Physics Department, Univsersidad de Chile, Santiago, Chile (May 2019)
New Discoveries Lecture Series, School of Earth and Space Exploration, Arizona State University (Jan. 2019)
Department of Geoscience, University of Nevada Las Vegas (April 2018)
Japan Society for the Promotion of Science, Pre-Forum Meeting on Future Cosmochemistry. The 21st "Science in Japan" Forum – US-Japan Collaboration in Space Sciences – Past, Present and Future, Washington DC (June 2016)
McPherson College, Keynote Speaker, Kansas Academy of Science, McPherson, KS (April 2016)
School of Earth and Space Exploration, Arizona State University, AZ (Feb. 2015)
Department of Physics, Washington University in St. Louis, MO (Two talks, Feb. 2015)

Department of Mineral Sciences, Smithsonian Institution, Washington, DC (Jan. 2015)
Lunar and Planetary Institute, Houston, TX (Feb. 2013)

Conference Talks

Annual Meeting of the Meteoritical Society (2022, 2017, 2013, 2011, 2007)
12th Symposium on Polar Science, National Institute of Polar Research (2021 - Virtual)
Lunar and Planetary Science Conference (2021, 2020*, 2019, 2017, 2016, 2015, 2014, 2013, 2012, 2010, 2009, 2008, 2007, 2006)
Hayabusa 2018, 6th Symposium of Solar System materials, JAXA (2018)
37th Symposium on Antarctic Meteorites, National Institute of Polar Research (2014)
Hayabusa 2014, 2nd Symposium of Solar System materials, JAXA (2014)

**2020 conference cancelled due to COVID-19*

Conference Posters

Hayabusa 2023, 10th Symposium of Solar System materials, JAXA (2023)
Annual Meeting of the Meteoritical Society (2023, 2022, 2017, 2009)
Buseck Center for Meteorite Studies Symposium (2023)
11th Symposium on Polar Science, National Institute of Polar Research (2020 - Virtual)
Lunar and Planetary Science Conference (2020*, 2019, 2018, 2017, 2016)
Asteroid Science in the Age of Hayabusa2 and OSIRIS-REx (2019)
41st Symposium on Antarctic Meteorites, National Institute of Polar Research (2018)

**2020 conference cancelled due to COVID-19*

Professional Societies/Memberships

The Meteoritical Society

Grants and Contracts

Current

Title: Investigating Grain Migration in the Protoplanetary Disk: Elemental and Isotopic Analysis of Chondrule Precursors

Role: Principal Investigator
Sponsoring agency: NASA
Program Name: ROSES 2022, Emerging Worlds
Total budget: $496,663
Performance period: April. 1st, 2023 to March 31st, 2026
Commitment: 3 months/year, 0.25 FTE

Title: Constraining asteroidal formation and alteration conditions via microstructure and elemental compositions of sulfides from returned samples

Role: Principal Investigator
Sponsoring agency: NASA
Program Name: ROSES 2016, Laboratory Analysis of Returned Samples
Total budget: $343,000

Performance period: Feb. 1st, 2017 to Jan. 31st, 2024
Commitment: 3 months/year, 0.25 FTE

Title: Determining Phobos' Origin via the Opaque Mineralogy of Returned Samples
Role: Co-Investigator (PI: Jemma Davidson)
Sponsoring agency: NASA
Program Name: ROSES 2022, Martian Moons Exploration Participating Scientist Program (MMX-PSP)
Total budget: $787,000
Performance period: April. 1st, 2023 to March 31st, 2032
Commitment: *de minimus* in Years 1 – 7, 1 months/year in Year 8 and Year 9, 0.08 FTE

Title: The Origin and Evolution of Sulfides in Asteroid Ryugu
Role: Co-Investigator (PI: Thomas J. Zega)
Sponsoring agency: NASA
Program Name: ROSES 2022, Laboratory Analysis of Returned Samples
Total budget: $752,363
Performance period: July 1st, 2023 to June 30th, 2026
Commitment: 0.125 FTE in Year 1 (1.5 month/year), 0.167 FTE in Year 2 (2 months/year), 0.167 in Year 3 (2 months/year)

Title: Origins of the solar system boron isotope ratio inferred from the Li and B isotopic compositions of chondrule olivines
Role: Collaborator
Sponsoring agency: NASA
Program Name: ROSES 2021, Emerging Worlds
Total budget: $727,970
Performance period: 2023 to 2026
Commitment: *de minimus*

Pending

None

Previously Funded

Title: Experimental **A**strophysics **R**esearch into **T**errestrial growt**H** (EARTH)
Role: Collaborator (PI: Nicolás Mujica)
Sponsoring agency: Comisión Nacional de Investigación Científica y Tecnológica (CONICYT), Chile
Program name: QUIMAL-CONICYT FUND – 2016
Total budget: 549,060,520 CLP (~821,230 USD)
Performance period: Jan. 2nd 2017 to Jan. 1st, 2021
Commitment: *de minimis*

Title: Using three isotope systems (Cr, Ti, and O) to address two important questions in planetary science via one sample suite of ungrouped chondrites: 3, 2, 1, Go!

Role: Collaborator (PI: Meenakshi Wadhwa)
Sponsoring agency: NASA
Program Name: Future Investigators in NASA Earth and Space Science and Technology
Total budget: $40,795
Performance period: Sept. 1st, 2019 to Aug. 31st, 2020
Commitment: *de minimis*

Title: Supporting the Spectral Analysis Science Test Data
Role: Principal Investigator
Sponsoring agency: NASA
Program name: OSIRIS-REx Mission Subcontract
Total budget: $31,192
Performance period: Sept. 1st, 2017 to Aug. 31st, 2018
Commitment: 2 months/year, 0.17 FTE

Title: Supporting the Spectral Analysis Science Test Data
Role: Principal Investigator
Sponsoring agency: NASA
Program name: OSIRIS-REx Mission Subcontract
Total budget: $50,798
Performance period: Nov. 1st, 2015 to Dec. 31st, 2016
Commitment: 3 months/year, 0.25 FTE

Publications

I have published 48 peer-reviewed publications, 19 as first author and 27 as co-author. This includes 45 publications in journals and three book chapters. I also have an additional five peer-reviewed papers as part of the OSIRIS-REx spacecraft mission team author list (for a total of 53 peer-reviewed publications). I have one first authored manuscript and two co-authored manuscripts in submission. I have one white paper as co-author. I have also published 115 conference abstracts. As of January 12th, 2024 according to according to Google Scholar my publications have generated 2022 citations, an h-index of 23, and an i10-index of 39 (this does not include the five co-authored mission papers). According to Scopus (profile here), as of January 12th, 2024 my publications have generated 2528 citations, with an h-index of 24 (this includes mission papers).

In Print and In Press

Journals

45. Mouti Al-Hashimi X., Davidson J., **Schrader D. L.**, and Bullock E. S. (2024) Fine-grained chondrule rims in Mighei-like carbonaceous chondrites: Evidence for a nebular origin and modification by impacts and recurrent solar radiation heating. *Meteorit. Planet. Sci.* **In Press,** https://doi.org/10.1111/maps.14076
44. Zhang B., Lin Y., Hao J., **Schrader D. L.**, Wadhwa M., Korotev R. L., Hartmann W. K., and Bouvier A. (2023) SIMS U-Pb dating of micro-zircons in lunar meteorites Dhofar 1528 and Dhofar 1627. *Meteorit. Planet. Sci.* **58**, 1540–1551. https://doi.org/10.1111/maps.14078

43. Davidson J. and **Schrader D. L.** (2023) The CR chondrites: Treasure troves from the early Solar System. *Elements* **19(2)**, 127–128. https://doi.org/10.2138/gselements.19.2.127.
42. Gattacceca J., McCubbin F. M., Grossman J. N., **Schrader D. L.**, Chabot N. L., D'Orazio M., Goodrich C., Greshake A., Gross J., Joy K. H., Komatsu M., and Miao B. (2023) The Meteoritical Bulletin, No. 111. *Meteorit. Planet. Sci.* **58**, 901–904. https://doi.org/10.1111/maps.13995
41. Zhu K., Schiller M., Moynier F., Groen M., Alexander C. M. O'D., Davidson J., Schrader D. L., Bischoff A., and Bizzarro M. (2023) Chondrite diversity revealed by chromium, calcium and magnesium isotopes. *Geochim. Cosmochim. Acta* **342**, 156–168. https://doi.org/10.1016/j.gca.2022.12.014
40. Gattacceca J., McCubbin F. M., Grossman J., Bouvier A., Chabot N. L., D'Orazio M., Goodrich C., Greshake A., Gross J., Komatsu M., Miao B., and **Schrader D.** (2022) The Meteoritical Bulletin, No. 110. *Meteorit. Planet. Sci.* **57**, 2102–2105. https://doi.org/10.1111/maps.13918
39. **Schrader D. L.** and Davidson J. (2022) Prolonged early migration of dust from the inner Solar System to the comet-forming region. *Earth Planet. Sci. Lett.* **589**, 117552. https://doi.org/10.1016/j.epsl.2022.117552
38. Dunham E. T. Wadhwa M., Desch S. J., Liu M.-C., Fujimoto Y., Fukuda K., Kita N., Hertwig A.T., Hervig R. L, Defouilloy C., Simon S. B., Davidson J., and **Schrader D. L.** (2022) Uniform ^{10}Be/^{9}Be in chondritic refractory inclusions: Implications for molecular cloud origin of ^{10}Be and the Sun's birth environment. *Geochim. Cosmochim. Acta* **324**, 194 – 220. https://doi.org/10.1016/j.gca.2022.02.002
37. Zhu K., Moynier F., Alexander C. M. O'D., Davidson J., **Schrader D. L.,** Zhu J-M., Wu G-L., Schiller M., Bizzarro M., and Becker H. (2021) Chromium stable isotope panorama of chondrites and implications for Earth early accretion. *ApJ.* **923**, 94. https://doi.org/10.3847/1538-4357/ac2570
36. Gattacceca J., McCubbin F. M., Grossman J., Bouvier A., Bullock E., Chennaoui Aoudjehane H., Debaille V., D'Orazio M., Komatsu M., Miao B., and **Schrader D. L.** (2021) The Meteoritical Bulletin, No. 109. *Meteorit. Planet. Sci.* **56**, 1626–1630. https://doi.org/10.1111/maps.13714
35. Hamilton V. E., Kaplan H. H., Christensen P. R., Haberle C. W., Rogers A. D., Glotch T. D., Breitenfeld L. B., Goodrich C. A., **Schrader D. L.**, Lantz C., Hanna R. D., and Lauretta D. S. (2021) Evidence for limited compositional and particle size variation on asteroid (101955) Bennu from thermal infrared spectroscopy. *Astronomy & Astrophysics* **650**, A120. https://doi.org/10.1051/0004-6361/202039728**.**
34. **Schrader D. L.**, Davidson J., McCoy T. J., Zega T. J., Russell S. S., Domanik K. J., and King A. J. (2021) The Fe/S ratio of pyrrhotite group sulfides in chondrites: An indicator of oxidation and implications for return samples from asteroids Ryugu and Bennu. *Geochim. Cosmochim. Acta* **303**, 66–91. https://doi.org/10.1016/j.gca.2021.03.019
33. Merlin F., Deshapriya J. D. P, Fornasier S., Barucci M. A., Praet A., Hasselmann P. H., Clark B. E., Hamilton V. E., Simon A. A., Reuter D. C., Zou X.-D., Li J.-Y., **Schrader D. L.**, and Lauretta D. S. (2021) In search of Bennu analogs: Hapke modeling of meteorite mixtures. *Astronomy & Astrophysics* **648**, A88. https://doi.org/10.1051/0004-6361/202140343
32. Zhu K., Moynier F., Schiller M., Alexander C. M. O'D., Davidson J., **Schrader D. L.**, van Kooten E., and Bizzarro M. (2021) Chromium isotopic insights into the origin of chondrite

parent bodies and the early terrestrial volatile depletion. *Geochim. Cosmochim. Acta* **301**, 158–186. https://doi.org/10.1016/j.gca.2021.02.031

33. Torrano Z. A., **Schrader D. L.**, Davidson J., Greenwood R. C., Dunlap D. R., and Wadhwa M. (2021) The relationship between CM and CO chondrites: Insights from combined analyses of titanium, chromium, and oxygen isotopes in CM, CO, and ungrouped chondrites. *Geochim. Cosmochim. Acta* **301**, 70–90. https://doi.org/10.1016/j.gca.2021.03.004
30. Donaldson Hanna K. L., Bowles N. E., Warren T. J., Hamilton V. E., **Schrader D. L.**, McCoy J. T., Temple J., Clack A., Calcutt S., and Lauretta D. S. (2021) Spectral Characterization of Bennu Analogs Using PASCALE: A New Experimental Set-up for Simulating the Near-Surface Conditions of Airless Bodies. *Journal of Geophysical Research: Planets* **126**, e2020JE006624. https://doi.org/10.1029/2020JE006624
29. **Schrader D. L.**, Nagashima K., Davidson J., McCoy T. J., Ogliore R. C., and Fu R. R. (2020) Outward migration of chondrule fragments in the Early Solar System: O-isotopic evidence for rocky material crossing the Jupiter Gap? *Geochim. Cosmochim. Acta* **282**, 133–155. https://doi.org/10.1016/j.gca.2020.05.014
28. Fu R. R., Kehayias P., Weiss B. P., **Schrader D. L.**, Bai X.-N., and Simon J. B. (2020) Weak magnetic fields in the outer solar nebula recorded in CR chondrites. *Journal of Geophysical Research: Planets* **125.** e2019JE006260. https://doi.org/10.1029/2019JE006260
27. Wadhwa M., McCoy T. J., and **Schrader D. L.** (2020) Advances in Cosmochemistry Enabled by Antarctic Meteorites. *Annual Review in Planetary Science* **48**, 233–258. https://doi.org/10.1146/annurev-earth-082719-055815
26. Davidson J., **Schrader D. L.**, Alexander C. M. O'D., Nittler L. R., and Bowden R. (2019) Re-examining thermal metamorphism of the Renazzo-like (CR) carbonaceous chondrites: Insights from pristine Miller Range 090657 and shock-heated Graves Nunataks 06100. *Geochim. Cosmochim. Acta* **267**, 240–256. https://doi.org/10.1016/j.gca.2019.09.033
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