Nancy J. McMillan, Ph.D., AOJN

Regents Professor Emerita

Department of Geological Sciences

New Mexico State University

**Personal Information**

Date of Birth: 6 October 1957 Citizenship: USA by birth

**Education**

Ph.D. Geology, 1986, Southern Methodist University, Dallas, Texas

 Cumulative GPA: 4.00

Dissertation: Petrology and geochemistry of andesites and dacites, Taos Plateau volcanic field, northern New Mexico

B.S. Geology, 1979, New Mexico State University, Las Cruces, New Mexico

B.A. Russian, 1979, New Mexico State University, Las Cruces, New Mexico

 Cumulative GPA: 3.98

 Earth Sciences GPA: 4.00

 Languages and Linguistics GPA: 4.00

 Senior Thesis: Petrographic evidence for magma mixing: Application to west-side trachyte-tristanites, Organ Mountains, New Mexico

**Professional Experience**

Senior Scientific Advisor, Materialytics Technology Corp, 2022 - present

Regents Professor Emerita, New Mexico State University, 2024 - present

New Mexico State University, Las Cruces, New Mexico, 1989-2024

 Regents Professor, 2017 - 2024

 Distinguished Achievement Professor, 2012 - 2024

Academic Department Head, August 2007 – 2024

Interim Department Head, Psychology, January 2020-July 2022

 Professor, 2002-2024

 Associate Professor, 1989-2002

 Tenure, 1993

 Undergraduate courses:

 Survey of Geology, Inquiry-based Instruction (GEOL 111G)

 Mineralogy (GEOL 310)

 Optical Mineralogy (GEOL 312)

 Igneous and Metamorphic Petrology (GEOL 399)

 Geology of the National Parks, Project-based Instruction (GEOL 315)

 Graduate courses:

 Advanced Principles of Geochemical Equilibria (GEOL 515)

 Analytical Geochemistry (GEOL 562)

 Global Geochemical Systems (GEOL 567)

Eastern Illinois University, Charleston, Illinois, 1983-1989

 Instructor, 1983-1987

 Assistant Professor, 1987-1988

 Tenure, 1988

 Associate Professor, 1988-1989

**Awards**

1st place poster, 2018 NMSU University Research Council Faculty Research and creative Activities Fair

Regents Professor, NMSU, 2017

Distinguished Achievement Professor, NMSU, 2012

Fellow, Geological Society of America, 2009

Woman of Faith Award, Women’s History Month, 2003

Dennis W. Darnall Faculty Award for Excellence in Teaching, Research, and Service, 2002, New Mexico State University

Las Cruces Citizen of the Year, 1999, Las Cruces Realtors Association

Outstanding Volunteer Fund-Raiser, 1999, National Society of Fund Raising Executives

Citizen of the Year, 1998, Social Workers of New Mexico

Outstanding Alumna, Centennial Scholar, 1988, New Mexico State University (one of 100 NMSU alumni chose to celebrate the university’s centennial)

Huffington Fellowship for Graduate Studies, Geology, Southern Methodist University, 1982-83

Outstanding Senior, College of Arts and Sciences, New Mexico State University, 1979

**Professional Service**

Professional Memberships

* Geological Society of America
* American Geophysical Union
* Mineralogical Society of America
* New Mexico Geological Society

Principal Professional Service

* Geological Society of America, Annual Program Committee, Education Committee, 2014-2018
* Geological Society of America, Council (Board of Directors), 2005-2008
* Board of Trustees, New Mexico Museum of Natural History, 2007 – 2011 (appointed by Governor of New Mexico)
* Geological Society of America, Annual Program Committee, 2011-present
* Geological Society of America, Membership Committee, 2007-2009
* Geological Society of America, Subaru Outstanding Woman in Science Award Committee, 2007-2008
* Geological Society of America, Liaison to Geoscience Education Division, 2005-2008
* Geological Society of America, Liaison to Geoinformatics Division, 20072008
* Geological Society of America, Day Medal Committee, 2007
* Geological Society of America, Young Scientist Medal Committee, 2001-2004
* Geological Society of America, Chair, Rocky Mountain Section, 1997
* Mineralogical Society of America, co-Chair of Outreach Committee, 1998-2003
* Mineralogical Society of America, Committee on Distinguished Service Award, 2009-2012
* National Science Foundation S-STEM Panel, 2006, 2007, 2008
* National Science Foundation GK12 Panel, 2006
* National Science Foundation Graduate Research Fellowship Program, panel member, 2001-2002, panel chair, 2003

Principal University Service

* Director, College of Arts and Sciences Discovery Scholars Program (undergraduate research), 2016-present
* Director, Analytical Geochemistry Research Laboratory, 1989-present
* NCA Accreditation Mission Committee, 2005-present
* STEM Working Group, Member, 2005-present
* Director, Regents’ Summer Program (Recruiting of top high school students), 1994-1997
* University Appeals Board, 1995-2000, chair, 1996, 2001
* Faculty Senate, 2000-2003
* University Research Council, 1992-1994
* Arts and Sciences Research Affairs Committee, 1990-1994 (chair, 1991)

**Research Interests**

**LIBS (Laser-Induced Breakdown Spectroscopy)**. LIBS is a relatively new technique that adds two major capabilities to the geochemical repertoire. First, LIBS is simple and immediate, allowing one to take thousands of measurements per hour. Second, LIBS is very sensitive to the light elements (Li, Be, B) which are difficult to analyze by existing techniques.

* Analysis of gems (diamond, emerald, ruby, sapphire) to determine provenance of individual stones.
* Analysis of tourmaline sand grains to determine the source regions for ancient sedimentary rocks.
* Analysis of heavy minerals (garnet, rutile, zircon, tourmaline, hornblende, etc.) in ancient sands to correlate rock units and solve tectonic problems.
* Analysis of basalts to aid in application of LIBS on Mars.
* Rapid, in situ, identification of biologically produced calcite in caves.

**Research Grants Awarded**

* National Science Foundation, Instrumentation and Facilities (EAR): Collaborative Research: A new approach to detrital provenance determination: Application of Laser-Induced Breakdown Spectroscopy (LIBS) to the tourmaline supergroup minerals, $148,372, 2016-2018
* Finalist, NMSU LAUNCH program for development of BackPack LIBS, able to compete for $25,000 for commercialization of technology
* Kansas Department of Transportation Pooled Fund Program through Chesner Engineering, PD: Real-Time Quality Control Monitoring and Characterization of Aggregate Materials in highway Construction using Laser Induced Breakdown Spectroscopy, 2013-2016, $100,000.
* National Cooperative Highway Research Program through Chesner Engineering, PC: Prototype Development: Automated and Continuous Aggregate Sampling and Laser Targeting (SLT) System, 2013-2014, $35,000.
* NMSU Interdisciplinary Research Grant (with Dr. Chanover in Astronomy and Dr. Voelz in Electrical Engineering): Searching for Life in Extreme Environments: A New Mexico Cave as a Solar System Analog, 2013, $40,000.
* National Cooperative Highway Research Program through Chesner Engineering, PC: Laser Spectroscopy for Rapid Profiling of Steel Bridge Coating, Corrosion, and Heavy Metals, 2012-2014, $35,000.
* National Cooperative Highway Research Program through Chesner Engineering, PC.: Automated Laser Spectrographic Pattern Matching for Aggregate Identification, 2010-2012, $35,000.
* US Department of Transportation through Oklahoma State University: Laser Characterization of Fine Aggregate Properties: 2010-2013, $25,000.
* National Park Service, Bandelier National Monument: Sampling, Testing and Analysis of Anthropogenically Altered Portions of the Tshigere Bandelier Tuff, 2008-2010, $60,000
* NMSU, Undergraduate Interdisciplinary Research Grant, Removal of As from water using natural and synthetic iron oxides and oxyhydroxides, with Dr. Michael Johnson, Chemistry and Biochemistry, $48,000, 2008-2009
* New Mexico Department of Economic Development, Picosecond Laser Applications in Gem Analysis, $113,000, 2008-2009
* NMSU Arts and Sciences Minigrant, Analysis of Lithium by Laser-Induced Breakdown Spectroscopy, $1,000, 2006
* National Science Foundation, Division of Graduate Education, GK12, $1, 518,219, 2003-2006
* Department of Defense, Laser-Induced Breakdown Spectroscopy, $188,000, 2005-2007
* Toshiba America Foundation, Middle School Science Education, $19,020, $16,000, 2004, 2005
* National Science Foundation, Petrology and Geochemistry, Continental Extension, $70,000, 1991-1993
* National Science Foundation, REU Supplement, Continental Extension, $1, 1991-1993
* Institute of Geophysics and Planetary Physics, LANL, Continental Extension, $7000, $14,000, 1990, 1991

**Graduate Student Theses**

Blackford, Rodney

 The effect of pyrite concentrations on resistivity measurements: Implications for hydrocarbon exploration (2015)

Bothern, Lawrence

Geothermal contribution to Rio Grande salt load (2003)

Causey, Scott

 Magma Mixing in the Florida Mountains Pluton, New Mexico (2010)

Channell, Ryan

Igneous geology of the Little Hatchet Mountains, Hidalgo and Grant Counties, southwestern New Mexico (2001)

Chapman-Fahey, Joyce

Petrology of an Upper Cretaceous Volcanic Complex as recorded in clasts of the McRae and Love Ranch Formations, Jornada del Muerto basin, south-central New Mexico (1996)

Cowee, Christie

Petrology of Upper Jurassic-Lower Cretaceous aphanitic leucogranites, Whetstone Mountains, Arizona (2003)

Curry, John

 Analysis of Boron isotopes in tourmaline using Laser-Induced Breakdown Spectroscopy (2015)

Ervin, Sheryl

 Cambrian plutonism in southern New Mexico: The Florida Mountains intrusion (1998)

Furgal, Stephanie

Whole-rock geochemistry of sandstones of the La Popa basin, NE Mexico: Provenance evaluation (2006)

Garrison, Jennifer

Structural implications of allochthogenic igneous, metavolcanic and carbonate blocks in the Papalote evaporite diapir, La Popa basin, Nuevo Leon, Mexico (1998)

Gibson, Marie

Zoning of watermelon tourmaline (2024)

Haag, David

 Late Oligocene toearly Pleistocene basalts of southwestern New Mexico (1991)

Haga, Marc

 Petrogenesis of Eocene and Oligocene igneous rocks of the Dona Ana Mountains (1994)

Hernandez, Mary

LIBS analysis of sulfur in coal (2009)

Kirkpatrick, Leyla

Petrology of the Sylvanite intrusive complex, Little Hatchet Mountains, southwestern New Mexico (2004)

Mader, Sandra

Quantitative analysis of Li using Laser-Induced Breakdown Spectroscopy (2013)

Marmalejo, Jose

 Identification of the extent of contamination in abandoned mines in New Mexico using satellite imagery, spatial radiometry, and laser-induced breakdown spectroscopy (2023)

McManus, Catherine

 Trace element variability in beryl using laser-induced breakdown spectroscopy (LIBS): Implications for determining provenance (2007)

Michelfelder, Gary

 Petrogenesis of the Sierra Cuchillo Laccolith, New Mexico (2009)

Montoya, Carlos

 Development of Corrosion Index for Steel Structures using Laser-Induced Breakdown Spectroscopy (2014)

Mount, Cole

Determination of sediment sources involved in continental margin sedimentation using the Ross Orogen, Eastern Antarctica using LIBS and EMP analysis of detrital tourmaline (2018)

Mullins, Carolyn

 Method development of LIBS as a provenance tool for modern sediments (2022)

Paliewicz, Cory

 Petrology and geochronology of the Faulkner Canyon dike swarm, Dona Ana County, New Mexico (2015)

Piper, Jacob

 Provenance of clastic sedimentary rocks in the Permian Abo formation, New Mexico, as determined by LIBS analysis of heavy minerals (2023)

Tatro, Danielle

 Characterization of 239,240Plutonium radionuclide sorption to soil particles and mineral dust aerosols (2007)

Van Dusen, Anna

 The origin of chemical zones in tourmalines from the Anjanbonoina pegmatite, Madagascar (2022)

Yetter, Kristen

 Provenance determination of rubies and sapphires using Laser-Induced Breakdown Spectroscopy (2011)

Young, John

Volcanology and geochemistry of the Upper Cretaceous-Lower Tertiary Hidalgo Formation: Remnant of a Laramide volcanic center, southwestern New Mexico (1996)

**Edited Volumes**

Lawton, T. F., *McMillan, N.J*., and McLemore, V. T., 2000, Southwest Passage: A Trip through the Phanerozoic: New Mexico Geological Society Guidebook 51, 281 p.

**Articles**

**Graduate Student Authors in Bold**

Undergraduate Student Authors Underlined

**2024**

Dutrow, B.L., McMillan, N.J., and Henry, D.J., 2024, A multivariate statistical approach for mineral geographic provenance determination using Laser-Induced Breakdown Spectroscopy and Electron Microprobe Chemical Data: A case study of copper-bearing tourmalines: American Mineralogist, 109, 1085-1095.

McMillan, N.J., and Dutrow, B.L., 2024, Laser-Induced Breakdown Spectroscopy analysis of tourmaline: Protocols, procedures, and predicaments: European Journal of Mineralogy, 36, 369-379, <https://doi.org/10.5194/ejm-36-369-2024>.

**2023**

McManus, C.E., and McMillan, N.J., 2023, Full Spectrum Multivariate Analysis of LIBS Data, in, Singh, V.K., et al., eds., Laser Induced Breakdown Spectroscopy (LIBS): Concepts, Instrumentation, Data Analysis, and Applications, v. 1, p. 213-227.

McMillan, N.J., and McManus, C.E., 2023, Application of Multivariate Analysis to the Problem of the Provenance of Gem Stones (Ruby, Sapphire, Emerald, Diamond), in, Singh, V.K., et al., eds., Laser Induced Breakdown Spectroscopy (LIBS): Concepts, Instrumentation, Data Analysis, and Applications, v. 1, p. 287 – 303.

**2020**

McManus, C.E., McMillan, N.J., Dowe, J., and Bell, J., 2020, Diamonds Certify Themselves: Multivariate Statistical Provenance Analysis: Minerals. doi https://www.mdpi.com/2075-163X/10/10/916.

Omer, M., Idowu, O.J., Brungard, E.W., Ulery, A.L., and *McMillan, N.J*., 2020, Visible Near-Infrared Reflectance and Laser-Induced Breakdown Spectroscopy for estimating soil quality in arid and semiarid agroecosystems: Soil Systems, 4, 42. doi:10.3390/soilsystems4030042.

**2019**

*McMillan, Nancy J*., Chesner, Warren H., and O’Neil, Eileen, 2019, Laser Scanning of Highway Aggregates: Results of a Transportation Pooled Fund Study: 70th Highway Geology Symposium, 13 p.

**2018**

Farnsworth-Pinkerton, S., *McMillan, N. J*., Dutrow, B. L., Henry, D. J., 2018, Provenance of detrital tourmalines from Proterozoic metasedimentary rocks in the Picuris Mountains, NM, USA using Laser-Induced Breakdown Spectroscopy: Journal of Geosciences, 63: 193-198.

McManus, Catherine E., Dowe, James, and *McMillan, Nancy J*., 2018, Quantagenetics® analysis of laser-induced breakdown spectroscopic data: Rapid and accurate authentication of materials: Spectrochimica Acta Part B: Atomic Spectroscopy, 145: 79-85. doi.org/10.1016/j.sab.2018.04.010

*McMillan, Nancy J.,* **Curry, John**, Dutrow, Barbara L., and Henry, Darrell J., 2018, Identification of the host lithology of tourmaline using Laser-Induced Breakdown Spectroscopy for application in sediment provenance and mineral exploration: Canadian Mineralogist, 56: 393-410.

**2017**

**Uckert, Kyle**, Chanover, Nancy J., Getty, Stephanie, Voelz, David G., Brinckerhoff, William B., McMillan, Nancy, Xiao, Xifeng, Boston, Penelope J., Li, Xiang, McAdam, Amy, Glenar, David A., and Chavez, Arriana, 2017, The characterization of biosignatures in caves using an instrument suite: Astrobiology, 17: 1203-1218.

**2016**

Arikawa, Fumiyasu, Gonzales, David, *McMillan, Nancy*, and **Murphy, Molly**, 2016, Evaluation of Trachyte Tempered Pottery Sherds from Chaco and Chaco Outlier Sites: Journal of Archaeological Science: Reports 6: 115-124.

**2015**

**Kochelek, K.A.,** *McMillan, N.J.*, McManus, C.E., and Daniel, D.L., 2015, Provenance determination of sapphires and rubies using Laser-Induced Breakdown Spectroscopy and multivariate analysis: American Mineralogist, 100: 1921-1931.

**2014**

*McMillan, N.J.*, Rees, S., **Kochelek, K.**, and McManus, C., 2014, Geologic Applications of Laser-Induced Breakdown Spectroscopy: Geostandards and Geoanalytical Research, v. 38, p. 329-343.

**Uckert, Kyle**, Chanover, Nancy, Getty, Stephanie, Brinckerhoff, William, Li, Xiang, Floyd, Melissa, Voelz, David, Xiao, Xifeng, Tawalbehy, Rula, and *McMillan, Nancy J.*, 2014, A comparative study of in situ biosignature detection spectroscopy techniques on planetary surfaces: Aerospace Conference, 2014 IEEE, p. 1-12.

**2012**

Chesner, W.H., *McMillan, N.J.,* and Cross, S.A., 2012, Laser Characterization of Fine Aggregate: Oklahoma Transportation Center Report, 49 p.

*McMillan, N.J*., Montoya, C., and Chesner, W. H., 2012, Correlation of Limestone Beds using Laser-Induced Breakdown Spectroscopy and Chemometric Analysis: Applied Optics, 51:B213-B222.

**Michelfelder, G. S**., and *McMillan, N.J*., 2012, Geochemistry, origin, and U-Pb zircon ages of the Sierra Cuchillo Laccolith, Sierra County, New Mexico: New Mexico Geological Society Guidebook, 63rd Field Conference, p. 249-260.

**2009**

Harmon, R. S., Remus, J., *McMillan, N.J*., **McManus, C.,** Collins, L, Gottfried, J. L., Jr., DeLucia, F. C., and Miziolek, A. W., 2009, LIBS analysis of geomaterials: Geochemical fingerprinting for the rapid analysis and discrimination of minerals: Applied Geochemistry, 24: 1125-1141.

**2008**

**McManus, C. E.**, *McMillan, N. J.*, Harmon, R. S., Whitmore, R. C., DeLucia, F., and Miziolek, A. W., 2008, Use of laser induced breakdown spectroscopy in the determination of gem provenance: beryls: Applied Optics, 47: G1-G9.

**2007**

*McMillan, N. J.*, Harmon, R. S., De Lucia, F. C., and Miziolek, A. M., 2007,

Laser-Induced Breakdown Spectroscopy Analysis of Minerals: Carbonates and Silicates: Spectrochimica Acta, Part B, 62: 1528-1536.

**2006**

Harmon, R. S., DeLucia, F. C., **McManus, C. E.**, *McMillan, N. J.*, Coveney, R., Jenkins, T. F., Walsh, M. E., and Miziolek, A., 2006, Laser-induced breakdown spectroscopy—An emerging chemical sensor technology for field-portable, real-time geochemical, mineralogical, and environmental applications: Applied Geochemistry, 21:730-747.

One of the Top-50 most cited articles published in Applied Geochemistry

between January 2006 and February 2011.

McMillan, N.J., **McManus, C. E.**, Harmon, R. S., DeLucia, F. C., and Miziolek, A. W., 2006, Laser-induced breakdown spectroscopy analysis of complex silicate minerals—beryl: Analytical Bioanalytical Chemistry, 385: 263-271.

**2004**

Buck, B. J., Merkler, D., Wolff, K., *McMillan, N.*, 2004, Relict Water Tables Indicated by Salt Mineralogy, Las Vegas Wash, Nevada USA, IN Selim Kapur, Erhan Akca, Luca Montanarella, Arda Ozturk, A. Mermut Eds., 12th International Meeting on Soil Micromorphology, Adana Turkey; European Communities, v. EUR 21275 EN/2, p. 5-7.

*McMillan, N.J*., 2004, Magmatic record of Laramide subduction and the transition to Tertiary extension: Upper Cretaceous through Eocene igneous rocks in New Mexico, in, Mack, G.H., and

Giles, K.A., eds., The Geology of New Mexico: A Geologic History, New Mexico Geological Society Special Publication 11, 249-270.

*McMillan, N.J.*, and McLemore, V.T., 2004, Cambrian-Ordovician magmatism and extension in New Mexico and Colorado: New Mexico Bureau of Geology and Mineral Resources, Bulletin 160, p. 1-11.

**2002**

Giles, K.A., *McMillan, N.J.*, and McCarson, B.L., 2002, Geochemical analysis and paleoecological implications of phosphatic microspherules (otoliths?) from Frasnian-Famennian boundary strata in the Great Basin, USA: Palaeogeography, Palaeoclimatology, Palaeoecology, v181: 111-125.

**2000**

**Channell, R.**, *McMillan, N.J.*, Lawton, T.F., Heizler, M., Esser, R.P., and McLemore, V.T., 2000, Magmatic history of the Little Hatchet Mountains, Hidalgo and Grant Counties, southwestern New Mexico: in, Lawton, T. F., *McMillan, N.J*., and McLemore, V. T., 2000, Southwest Passage: A Trip through the Phanerozoic: New Mexico Geological Society Guidebook 51, p. 141-148.

Lawton. T. F., *McMillan, N.J.*, McLemore, V.T., and Hawley, J.W., 2000, Second-day road log, from Lordsburg to Deming via Little Hatchet Mountains and Victorio Mountains, in, Lawton, T. F., *McMillan, N.J*., and McLemore, V. T., 2000, Southwest Passage: A Trip through the Phanerozoic: New Mexico Geological Society Guidebook 51, p. 17-30.

*McMillan, N.J.*, Dickin, A.P., and Haag, D., 2000, Evolution of magma source regions in the Rio Grande rift, southern New Mexico: Geological Society of America Bulletin, 112: 1582-1593.

*McMillan, N.J.*, McLemore, V.T., and Ervin, S.D., 2000, Cambrian tectonics of New Mexico and Colorado, in, Lawton, T. F., *McMillan, N.J*., and McLemore, V. T., 2000, Southwest Passage: A Trip through the Phanerozoic: New Mexico Geological Society Guidebook 51, p. 37-39.

*McMillan, N.J*., McLemore, V.T., Amato, J.M., Hawley, J.W., and Giles, K.A., 2000, Third-day road log, from Deming to Victorio Canyon and the southern Florida Mountains: in, Lawton, T. F., *McMillan, N.J*., and McLemore, V. T., 2000, Southwest Passage: A Trip through the Phanerozoic: New Mexico Geological Society Guidebook 51, p. 31-44.

**Young, J.R**., *McMillan, N.J.*, Lawton, T.F., and Esser, R.P., 2000, Volcanology, geochemistry, and structural geology of the Upper Cretaceous Hidalgo Formation, southwestern New Mexico: in, in, Lawton, T. F., *McMillan, N.J*., and McLemore, V. T., 2000, Southwest Passage: A Trip through the Phanerozoic: New Mexico Geological Society Guidebook 51, p. 149-156.

**1999**

**Garrison, J.M.**, and McMillan, N.J., 1999, Evidence for Jurassic continental-rift magmatism in NE Mexico: Allogenic metaigneous blocks in El Papalote evaporite diapir, La Popa Basin, Nuevo Leon, Mexico, in, Bartolini, C., Wilson, J.L., and Lawton, T.F., eds., Mesozoic sedimentary and tectonic history of north-central Mexico: Geological Society of America Special Paper 340, p. 319-332.

Lawton, T.F., and *McMillan, N.J.*, 1999, Arc abandonment as a cause for passive continental rifting: Comparison of the Jurassic Mexican Borderland rift and the Cenozoic Rio Grande rift: Geology, v. 27, p. 779-782.

McLemore, V.T., *McMillan, N.J.*, Heilzer, M., and McKee, C., 1999, Cambrian alkaline rocks at Lobo Hill, Torrance County, New Mexico: More evidence for a Cambrian-Ordovician aulacogen: New Mexico Geological Society Guidebook 50, p. 247-253.

**1998**

*McMillan, N.J*., 1998, Temporal and spatial magmatic evolution of the Rio Grande rift: in Mack, G., ed., New Mexico Geological Society Guidebook 49, p. 107-116.

**1993**

*McMillan, N.J.*, Davidson, J.P., Wörner, G., Harmon, R.S., Moorbath, S., and Lopez-Escobar, L., 1993, Influence of crustal thickening on arc magmatism: The Nevados de Payachata volcanic region, northern Chile: Geology, 21:467-470.

**1990**

Davidson, J.P., *McMillan, N.J.*, Moorbath, S., Wörner, G., and Harmon, R.S., 1990, The Nevados de Payachata volcanic region (18oS/69oW N. Chile) II. Evidence for widespread crustal involvement in Andean magmatism: Contributions to Mineralogy and Petrology, 105: 412-432.

**1989**

*McMillan, N.J.*, Harmon, R.S., Moorbath, S., Lopez-Escobar, L., and Strong, D., 1989, Crustal sources involved in continental arc magmatism: A case study of Volcan Mocho-Choshuenco, southern Chile: Geology, 17:1152-1156.

**1988**

*McMillan, N.J*., and Dungan, M.A., 1988, Open system magmatic evolution of the Taos Plateau volcanic field, northern New Mexico. 3 - The petrology of andesites and dacites: Journal of Petrology, 29:527-557.

Wörner, G., Harmon, R.S., Davidson, J.D., Moorbath, S., Turner, D.L., *McMillan, N.J*., Nye, C., Lopez-Escobar, L., and Moreno, H., 1988, The Nevados de Payachata volcanic group (18oS/69oW N. Chile): I. Geological, geochemical, and isotopic observations: Bulletin of Volcanology, 50:287-303.

**1986**

Dungan, M.A., Lindstrom, M.M., *McMillan, N.J.*, Moorbath, S., Hoefs, J., and Haskin, L., 1986, Open system magmatic evolution of the Taos Plateau volcanic field, northern New Mexico. 1 - The petrology and geochemistry of the Servilleta Basalt: Journal of Geophysical Research, 91:5999 - 6028.

*McMillan, N.J*., and Dungan, M.A., 1986, Magma mixing as a petrogenetic process in the development of the Taos Plateau magmatic system, New Mexico: Journal of Geophysical Research, 91:6029 - 6045.

**1984**

Dungan, M.A., Muehlberger, W.R., Leininger, L., Peterson, C., *McMillan, N.J.*, Gunn, G., Lindstrom, M. L., and Haskin, L., 1984, Volcanic and sedimentary stratigraphy of the Rio Grande gorge and the late Cenozoic geologic evolution of the southern San Luis valley: New Mexico Geological Society Guidebook, 35th Field Conference, Rio Grande Rift: Northern New Mexico, 157 - 169.

**Abstracts**

**2022**

Zwillich, F.C., Berlo, K., McMillan, N.J., and de Zeeuw-van Dalfsen, E., 2022, Amalgamation of plagioclase crystal populations from the magmatic system beneath the volcanic island, Saba: Goldschmidt Conference, 2022.

**2020**

Dutrow, Barbara L., Farnsworth-Pinkerton, Shoshauna, Henry, Darrell J., and McMillan, Nancy J., 2020, Copper-bearing tourmaline provenance from chemometrics of laser-induced breakdown spectroscopy (LIBS) and electron microprobe (EMP) data: Goldschmidt conference, 2020.

McMillan, Nancy, and McManus, Catherine, 2020, Quantagenetics ® and Machine Learning: A New Paradigm in Material Identification: Microscopy and Microanalysis: 26: 1874-1875.

Zwillich, Florentine, Berlo, Kim, McMillan, Nancy J., and de Zeeuw Van Dalfsen, Elske, 2020, Analysis of feldspar using laser-induced breakdown spectroscopy: Goldschmidt Conference, 2020.

**2019**

Dutrow, Barbara L., Farnsworth-Pinkerton, Shoshauna, Henry, Darrell J., and McMillan, Nancy J., 2019, Copper-bearing tourmaline sources: Evidence from Laser-Induced Breakdown Spectroscopy (LIBS) and Electron Microprobe Analyses (EMP): Geological Society of America Abstracts with Program, v. 51.

Farnsworth-Pinkerton, Shoshauna, Dutrow, Barbara L., Henry, Darrel J., and McMillan, Nancy J., 2019, Determining host-rock environment of tourmalinites using Laser-Induced Breakdown Spectroscopy: Geological Society of America Abstracts with Program, v. 51.

Gibson, Marie, and McMillan, Nancy J., A compositional analysis of zoned watermelon tourmalines using Laser-Induced Breakdown Spectroscopy (LIBS): Geological Society of America Abstracts with Program, v. 51.

Hansen, Jenelle A., McMillan, Nancy J., Dutrow, Barbara L., Mount, Cole, Henry, Darrell J., and Goodge, John, 2019, Provenance analysis of sediments related to the Cambrian Ross Orogen, Antarctica: Laser-Induced Breakdown Spectroscopy analysis of detrital tourmaline: Geological Society of America Abstracts with Program, v. 51.

McMillan, Nancy J., Dutrow, Barbara L., Henry, Darrell J., and McManus, Catherine E., 2019, Methods for tourmaline analysis by Laser-Induced Breakdown Spectroscopy: Geological Society of America Abstracts with Program, v. 51.

Piper, Jacob, M., McMillan, Nancy J., Hampton, Brian A., and Thompson, Hayden, 2019, Developing Laser-Induced Breakdown Spectroscopy (LIBS) to identify heavy minerals for correlating trends in basin provenance: Geological Society of America Abstracts with Program, v. 51.

**2018**

Mount, Cole, McMillan, Nancy J., Dutrow, Barbara L., Henry, Darrell J., and Goodge, John W., 2018, Tourmaline as an indicator of the provenance of detrital sediments: Linkage between the calc-alkaline arc and forearc basin of the Ross Orogen, Transantarctic Mountains, Antarctica: Geological Society of America Abstracts with Program, v. 50, doi: 10.1130/abs/2018AM-318692.

**2017**

McManus, Catherine E., and McMillan, Nancy J., 2017, Diamond provenance determined by multivariate analysis of LIBS spectra: New insights to diamond chemistry: Geological Society of America Abstracts with Program, v. 49.

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