

Dr. Theodore J. Bornhorst

Executive Director and Professor
A. E. Seaman Mineral Museum
Michigan Technological University

Dr. Bornhorst is Executive Director of the A.E. Seaman Mineral Museum of Michigan Tech. He is responsible for all aspects of the museum. He sets policies and procedures in consultation with museum staff and the Collections Management Committee. He supervises museum staff and manages museum operations and financial accounts and reports to the Associate Vice President of Administration. Bornhorst was the museum leader in the relocation of the museum from its previous main campus location of 35 years to its current location, a newly constructed dedicated facility, constructed in 2010-2011, which is now the permanent home for the museum. In addition to the main museum building, his efforts resulted in construction of the Mineral Preparation Annex, the Phyllis and John Seaman Garden, and the Copper Pavilion. In 2006, Bornhorst lead a complete revision of the museum's web site and he has played the central role in another revision completed in 2016. Bornhorst was the Michigan Tech representative and the key person in negotiation of the Michigan Mineral Alliance, a unique agreement between Michigan Tech and the University of Michigan to preserve the legacy of the University of Michigan mineral collection through shared responsibility and co-ownership. The University of Michigan mineral collection resides at the A. E. Seaman Mineral Museum.

In his capacity as Professor, Bornhorst has been engaged in teaching and research. His teaching responsibilities have varied over the year and have included: 36 years teaching various courses on metallic mineral deposits and exploration, 24 years teaching petrology, 32 years teaching field geology with engineering applications, and the past 4 years teaching mineralogy. He has also taught advanced courses in geochemistry, petrology, and mineral deposits. His research and that of the students he supervised have covered a breath of topics but with more emphasis on aspects of metallic mineral deposits, the geology and mineral resources of the Upper Peninsula of Michigan, geology and mineral resources in Finland, as well as topics involving environment, groundwater, and K-12 education. He was awarded the prestigious Goldich Medal in 2008 from the Institute on Lake Superior Geology for outstanding contributions to Lake Superior geology.

EDUCATION

Ph.D. - 1980 - Geology - University of New Mexico

M.S. - 1976 - Geology - University of New Mexico

B.S. - 1974 (with high honor) - Geology - Michigan Technological University

AWARDS

Goldich Medal 2008 from the Institute on Lake Superior Geology for outstanding contributions to Lake Superior geology

Commendation from Michigan Governor Granholm for service to the State of Michigan in helping enact Michigan's landmark Sulfide Mining Act, Public Act 449 of 2004.

Geoscience Information Society Best Guidebook Award for 1995

PROFESSIONAL EXPERIENCE

Executive Director, A. E. Seaman Mineral Museum, Michigan Technological University, Houghton, Michigan (2015 to present)

Professor with tenure, Department of Geological and Mining Engineering and Sciences, Michigan Technological University, Houghton, Michigan (September 1993 to present).

Director, A. E. Seaman Mineral Museum, Michigan Technological University, Houghton, Michigan (2003 to 2015)

Special Assistant to the Dean of Engineering (2003 to 2007)

Chair, Department of Geological and Mining Engineering and Sciences, Michigan Technological University, Houghton, Michigan (1998 to 2003)

Adjunct Professor, Department of Education, Michigan Technological University, Houghton, Michigan (1996 to 2014)

Associate Professor with tenure, Department of Geological Engineering, Geology and Geophysics, Michigan Technological University, Houghton, Michigan (1986 to 1993)

Visiting Associate Professor, Geological Survey of Finland, Espoo (1991)

Assistant Professor, Department of Geology and Geological Engineering, Michigan Technological University, Houghton, Michigan (1981 to 1986).

Visiting Scientist, Mt. St. Helens Volcano Observatory, U.S. Geological Survey, Vancouver, Washington (1980)

Post-Doctoral Research Associate and Visiting Assistant Professor, Department of Geology and Geological Engineering, Michigan Technological University, Houghton, Michigan (1980 to 1981)

Visiting Staff Member, Chemistry-Nuclear Chemistry Group, Los Alamos Scientific Laboratory, Los Alamos, New Mexico (1977 to 1980)

Paid Consulting Activities: Marquette University, PolyMet Mining Corp. via Foth, Keweenaw Land Association, Orvana Resources Corp, Phelps Dodge Exploration Corporation, Bell Resources Corporation, Grandcru Resources Corporation, Steigerwaldt Land Services, International Paper, Peninsula Copper Industry, Red Metal Minerals, Copper Range Company, Michigan Low Level Radioactive Waste Authority, Callahan Mining Corporation, Battelle Memorial Institute, ARCO Exploration and Technology Group, Michigan Geological Survey, Amselco Exploration, Camden, South Carolina, Hanna Mining Company, Los Alamos Scientific Laboratory, Kennecott Exploration

LICENSED PROFESSIONAL GEOLOGIST

State of Minnesota, Minnesota Board of Architecture, Engineering, Land Surveying (License Number 30247).

SPECIAL APPOINTMENTS

Mineral Wells Advisory Committee of the Michigan Department of Environmental Quality (2001 to present), Vice Chair (2006 to ~2010).

Invited to be on the Community Advisory Group for Kennecott's Eagle Project (2007 to 2008).

Charter Board Member of the Northern Michigan Geologic Repository Association (NMGRA) (2008-~2012)

Appointed to Work Group on Administrative Rules for Michigan's Nonferrous Metallic Mining Regulations, Part 632, Natural Resources and Environmental Protection Act, Act No. 451 of the Public Acts of 1994, as amended. (2005 to 2006); Only academic member.

Appointed to the Work Group on Regulation of Metallic Mineral Exploration and Mining in the State of Michigan. Appointed by the Director of the Michigan Department of Environmental Quality Director March 24, 2004. State of Michigan law which was passed by the Michigan Legislature and signed into law December 27, 2004 as Part 632, Natural Resources and Environmental Protection Act, Act No. 451 of the Public Acts of 1994, as amended; Only academic member.

Appointed to the Work Group on Metallic Mineral Leasing of State of Michigan Mineral Rights. (March to August, 2004). Only academic member..

Appointed to the Board of Governors of Michigan's Low-Level Radioactive Waste Research and Education Institute. The Board of Governors was convened in accordance with 1995 amendments to Section 17 (13) of Michigan Public Act 204. Appointed by Commissioner of the Michigan Low-Level Radioactive Waste Authority. Term of Appointment March 1, 1995 to March 1, 1998. Board disbanded by Michigan's Governor.

Appointed as Chairperson of the Siting Criteria Advisory Committee for Michigan's Low Level Radioactive Waste Authority. The committee was mandated by the Michigan legislature, Public Act 204, 1987. Appointment by Commissioner and Head of the Authority, David Hales; Chairperson - January 1988 to May, 1989.

Appointed to the Board of Governors of the International Low-Level Radioactive Waste Research and Education Institute. The institute was created by section 17 of Michigan Public Act 204 of 1987 and operated by a consortium from the University of Michigan and Michigan State University. Appointment by Michigan Low-Level Radioactive Waste Authority, University of Michigan, and Michigan State University. Term of Appointment March 22, 1989 to October 1, 1992 when committee was disbanded by Michigan Governor Engler upon withdrawal from the Midwest Low-Level Radioactive Waste Compact).

Appointed by Governor Blanchard, State of Michigan to the Radioactive Waste Control Committee legislated by Michigan Public Act 190 of 1985; term of appointment March 7, 1986 to April 15, 1988 (committee disbanded upon creation of the Low-level Radioactive Waste Authority).

Appointment confirmed by Governor Blanchard, State of Michigan, to Governor's Task Force on High-Level Radioactive Waste; Member July 1983 to April 1986 (committee disbanded when DOE ended search for crystalline rock site).

Appointed by Governor Blanchard's Office to be one of three state representatives at the Department of Energy's "States Weighting Workshop", Crystalline Rock Project held at Battelle Memorial Institute, Columbus, Ohio, May 20-22, 1985.

PROFESSIONAL SOCIETIES

Fellow Geological Society of America
Fellow Society of Economic Geologists
Fellow Geological Association of Canada
Member American Geophysical Union
Member Institute on Lake Superior Geology

SERVICE TO PROFESSIONAL ORGANIZATIONS

Principal Co-Chair, Board of Directors, Institute on Lake Superior Geology, 2013
Board of Directors, Institute on Lake Superior Geology, 2013-2016
Principal Co-Chair, Board of Directors, Institute on Lake Superior Geology, 2008
Board of Directors, Institute on Lake Superior Geology, 2008-2011
Short Course for 44th Annual Meeting of the American Institute of Professional Geologists held in Traverse City, MI titled "Exploration for and Mining of Metals with Emphasis on Michigan's Upper Peninsula (8 hours of presentations and discussion), 2007
Principal Co-Chair, Board of Directors, Institute on Lake Superior Geology, 1999
Board of Directors, Institute on Lake Superior Geology, 1999-2002
Executive Committee (1999-2001), U.S. Heads and Chairs of Earth and Space Science Departments within American Geophysical Union (Chair through October, 2000, Past Chair and member until October 2001) organized two day meeting held in Washington DC October 19 and 20, 2000 attended by about 50 department heads/chairs from across the U.S
Society of Economic Geologists, Short Course Committee, 1996-1999
Associate Secretary Treasurer, Institute on Lake Superior Geology, 1994-1999
Chair, Board of Directors, Institute on Lake Superior Geology, 1994
Board of Directors, Institute on Lake Superior Geology, 1994-1998
Principal Organizer of Society of Economic Geologists Field Conference, western Upper Michigan, 1992
Chair, Board of Directors, Institute on Lake Superior Geology, 1983
Board of Directors, Institute on Lake Superior Geology, 1983-1987

EDITORSHIP

Bornhorst, T.J. and Barron, R.J., editors, 2013, Institute on Lake Superior Geology, Proceedings, Field Trip Guidebook, 59th Annual Meeting, Houghton, MI v. 59, part 2, 118p.

Blaske, A.R. and **Bornhorst, T.J.**, editors, 2013, Institute on Lake Superior Geology, Proceedings, Program and Abstracts, 59th Annual Meeting, Houghton, MI v. 59, part 1, 83p.

Bornhorst, T.J. and Klasner, J.s., editors, 2008, Institute on Lake Superior Proceedings Volume 54, Field Trip Guidebook, published by Institute on Lake Superior Geology, St. Paul, MN, v. 54, part 2, 85p.

- Bornhorst, T.J.** and G.W. Robinson, editors, 2008, Institute on Lake Superior Proceedings Volume 54, Program and Abstracts, published by Institute on Lake Superior Geology, St. Paul, MN, v. 54, part 1, 85p.
- Woodruff, Laurel and **Bornhorst, T.J.** editors, 2003, Institute on Lake Superior Proceedings Volume 49, Program and Abstracts, published by Institute on Lake Superior Geology, St. Paul, MN, v. 49, part 1, 85p.
- Bornhorst, T.J.**, editor, 1999, Institute on Lake Superior Geology Proceedings Volume 45, Field Trip Guidebook, published by Institute on Lake Superior Geology, St. Paul, MN, v. 45, part 2, 176p.
- Regis, R.S., and **Bornhorst, T.J.**, editors, 1999, Institute on Lake Superior Geology Proceedings Volume 45, Program and Abstracts, published by Institute on Lake Superior Geology, St. Paul, MN, volume 45, part 1, 62p.
- Bornhorst, T.J.**, editor, 1998, ILSG Newsletter, published by the Institute on Lake Superior Geology, distribution of 600 copies mostly within U.S. and Canada with some to Europe, Number 1 published December 1995, Number 2 published December 1996, Number 3 published December 1997, Number 4 published December 1998.
- Bornhorst, T.J.**, 1997, Guest Editor for a special issue of the Canadian Journal of Earth Sciences, Petrology and Metallogeny of Intraplate Mafic and Ultramafic Magmatism, published April 1997, 238 pages; total of 36 manuscript reviews.
- Bornhorst, T.J.** and McDowell, S.D., editors, 1994, Institute on Lake Superior Geology Proceedings, Program and Abstracts, 40th Annual Meeting, Houghton, MI, v. 40, part 1, 84p.
- Bornhorst, T.J.**, editor, 1992, Keweenaw Copper Deposits of Western Upper Michigan, Society of Economic Geologists Guidebook Series, v. 13, 197 p.
- Bornhorst, T.J.** and Diehl, J.F., co-editors, 1983, Institute on Lake Superior Geology Proceedings 29th Annual Meeting, Houghton, MI, v. 29, 81 p.

PUBLICATIONS

- Bornhorst, T.J.**, and Molloy, L.J., in press, Geological and historical field trip to the Keweenaw Peninsula: Michigan Basin Geological Society.
- Ikehata, K., Chida, K., Tsunagae, T., and **Bornhorst, T.J.**, 2016, Hydrothermal Native Copper in Ocean Island Alkali Basalt from Mineoka Belt, Boso Peninsula, Central Japan: Economic Geology, v. 111, p. 783-794.
- Bornhorst, T.J.**, and Logsdon, M.J., 2016, Predicting Future Water-Quality Impacts from Mining: A 52-year Old Field Analog for Humidity Cell Testing, Copperwood Deposit, Michigan: Economic Geology, v. 111, p. 527-542.

- Bornhorst, T.J.** and Williams, W.C., 2013, The Mesoproterozoic Copperwood Sedimentary Rock-Hosted Stratiform Copper Deposit, Upper Peninsula, Michigan: *Economic Geology*, v. 108, p. 1325-1346.
- Bornhorst, T.J.** and Barron, R.J., 2013, Geologic Overview of the Keweenaw Peninsula, Michigan – Field Trip 1: Institute on Lake Superior Geology, Field Trip Guidebook, 59th Annual Meeting, Houghton, MI v. 59, part 2, p. 1-42.
- Bornhorst, T.J.**, Barron, R.J., and Whiteman, R.C., 2013, Caledonia Mine, Keweenaw Peninsula Native Copper District, Ontonagon County, Michigan – Field Trip 2: Institute on Lake Superior Geology, Field Trip Guidebook, 59th Annual Meeting, Houghton, MI v. 59, part 2, p. 43-57.
- Bornhorst, T.J.**, Blaske, A., Anderson, D, Repaal, T.D., 2013, Geology and Environmental Site Conditions of the Copperwood Deposit, Gogebic County, Michigan – Field Trip 6: Institute on Lake Superior Geology, Field Trip Guidebook, 59th Annual Meeting, Houghton, MI v. 59, part 2, p. 97-118.
- Bornhorst, T.J.**, and Barron, R.J., 2011, Copper deposits of the western Upper Peninsula of Michigan: Geological Society of America Field Trip Guide 24, p. 83-99.
- Bornhorst, T.J.**, and Brandt, D., 2009, Michigan's earliest geology: The Precambrian: in Schaeztl, R., Darden, J., and Brandt, D., eds., *Michigan Geography and Geology*, Pearson Custom Publishing, New York, p. 24-39.
- Bornhorst, T.J.**, and Lankton, L.D., 2009, Copper mining: A billion years of geologic and human history: in Schaeztl, R., Darden, J., and Brandt, D., eds, *Michigan Geography and Geology*, Pearson Custom Publishing, New York, p. 150-173.
- Rasilainen, K., Lahtinen, R., and **Bornhorst, T. J.**, 2008, Chemical characteristics of Finnish bedrock– 1:1000000 scale bedrock map units: Geological Survey of Finland, Report of Investigation 171, 96p.
- Rasilainen, K., Lahtinen, R. and **Bornhorst, T. J.**, 2007. The Rock Geochemical Database of Finland Manual. Geological Survey of Finland, Report of Investigation 164, 38 p.
The Rock Geochemical Database of Finland (online database): <http://www.gtk.fi/publ/RGDB>.
- Rasilainen, K., Lahtinen, R. and **Bornhorst, T.J.**, 2007, The Rock Geochemistry Database of Finland - a new tool for large scale exploration and crustal studies. In: Andrew, C.J. et al. (eds.) *Digging deeper*, Ninth biennial meeting of the Society for Geology Applied to Mineral Deposits, Dublin, Ireland 20th-23rd August 2007, p. 1267-1270.
- Karkkainen, N. K. and **Bornhorst, T.J.**, 2003, The Svecofennian gabbro-hosted Koivusaarenneva magmatic ilmenite deposit, Kälviä, Finland, *Mineralium Deposita*, v. 38, p. 169-184.
- Nurmi, P.A., **Bornhorst, T. J.**, and Rasilainen, K., 2001, Pathfinder Elements for Hydrothermal Gold Mineralization: From General to Case Studies: Proceedings of 2001: A Hydrothermal Odyssey, James Cook University Economic Geology Research Unit Contribution 59, May 17 - 19, 2001, Townsville, Australia, p. 156-157.

- Pregitzer, K.S., Reed, D.D., **Bornhorst, T.J.**, Foster, D.R., Mroz, G.D., McLachlan, J.S., Laks, P.E., Stokke, D.D., Martin, P.E., Brown, S.E., 1999, A buried spruce forest provides evidence at the stand and landscape scale for the effects of environment on vegetation at the Pliocene/Holocene boundary: *Journal of Ecology*, v. 88, p. 1-10.
- Bornhorst, T.J.**, 1999, Geologic Setting of the Tilden and Empire Mines, Michigan: Institute on Lake Superior Geology, Field Trip Guidebook, 45th Annual Meeting, v. 45, part 2, p. 108-113.
- Johnson, R.C., and **Bornhorst, T.J.**, Geologic Field Excursion to the Ishpeming Greenstone Belt: Institute on Lake Superior Geology, Field Trip Guidebook, v. 45, part 2, p. 45-56.
- Bornhorst, T.J.** and Bair, S.E., 1999, Introduction to the Ropes gold deposit in the Ishpeming Greenstone Belt, Michigan: Institute on Lake Superior Geology, Field Trip Guidebook, v. 45, part 2, p. 29-44.
- Johnson, R.C., and **Bornhorst, T.J.**, 1999, An Introduction to the Archean Ishpeming Greenstone Belt, Michigan: Institute on Lake Superior Geology, Field Trip Guidebook, v. 45, part 2, p. 12-28.
- Bornhorst, T.J.**, Nurmi, P.A., and Kontoniemi, O., 1998, Geochemistry of gold and associated elements in the Paleoproterozoic Osikonmaki gold deposit, southeastern Finland: *Geological Survey of Finland Special Paper 25*, p. 81-90.
- Bornhorst, T.J.**, Thorpe, R.I., and Johnson, R.C., 1998, Lead isotope study of veins in the Archean Ishpeming greenstone belt, Michigan: *Economic Geology*, v. 93, p. 102-107.
- Wahyudi, T., **Bornhorst, T.J.**, and Nesbitt, C., 1998, A comparative study of cyanide and bromine recovery of gold from a roasted Osikonmaki gold ore, Finland: *Geological Survey of Finland Special Paper 25*, p. 111-119.
- Taylor, L.G., and **Bornhorst, T.J.**, 1998, A boiling model for the formation of enargite-bearing veins in the Central City district, Colorado: *The Mountain Geologist*, v. 35, p. 15-22.
- Bornhorst, T.J.**, 1997, Tectonic context of native copper deposits of the North American Midcontinent rift system: *Geological Society of America Special Paper*, 312, p. 127-136.
- Marshak, S., Tinkham, D., Alkmin, F., Brueckner, H., and **Bornhorst, T.**, 1997, Dome-and-keel provinces formed during Paleoproterozoic orogenic collapse-core complexes, diapirs, or neither?: Examples from the Quadrilatero Ferrifero and the Penokean orogen: *Geology*, v. 25, p. 415-418.
- Nurmi, P.A., **Bornhorst, T.J.**, and Kontas, E., 1997, Trace element signature of selected gold deposits in the Fennoscandian Shield and the North American Continent: in Papunen, H., ed., *Mineral Deposits: Research and Exploration Where do They Meet?*, Balkema, Rotterdam, p. 253-255.
- Bornhorst, T.J.**, Nurmi, P.A., Rasilainen, K., and Kontas, E., 1995, Trace element characteristics of selected epithermal gold deposits of North America: *Geological Survey of Finland Special Paper 20*, p. 47-52.

- Bornhorst, T.J.**, 1995, Relationship between native copper deposits and tectonic development of the North American Midcontinent rift system: in Ojakangas, R.W. et al. (eds.), *Basement Tectonics* 10, Balkema, Rotterdam, p. 19-23.
- Woodruff, L.G., **Bornhorst, T.J.**, and Nicholson, S.W., 1995, Overview - Stratigraphy, structure, and ore deposits of the southern limb of the Midcontinent rift system: Minnesota Geological Survey Guidebook Series No. 20, "Field trip guidebook for the geology and ore deposits of the Midcontinent rift in the Lake Superior region," p. 73-80.
- Bornhorst, T.J.**, 1995, Native copper in basalts of the Keweenaw Peninsula: Minnesota Geological Survey Guidebook Series No. 20, "Field trip guidebook for the geology and ore deposits of the Midcontinent rift in the Lake Superior region," p. 97-104.
- Bornhorst, T.J.** and Rose, W.I., 1994, Self-guided geological field trip to the Keweenaw Peninsula, Michigan: Institute on Lake Superior Geology Proceedings, Field Trip Guidebook, v. 40, part 2, 185p. (4500 copies sold from May 1994 to 2014).
- Bornhorst, T.J.**, Rasilainen, K., and Nurmi, P.A., 1993, Geochemical character of lithologic units in the Late Archean Hattu schist belt, Iiomantsi, eastern Finland: Geological Survey of Finland Special Paper 17. p. 133-145.
- Bornhorst, T.J.**, and Rasilainen, K., 1993, Mass transfer during hydrothermal alteration associated with Au mineralization within the late Archean Hattu schist belt, Iiomantsi, eastern Finland: Geological Survey of Finland Special Paper 17, p. 273-289.
- Bornhorst, T.J.**, and Wilkin, R.T., 1993, Fluid inclusion data for selected quartz from gold prospects in the Hattu schist belt, Iiomantsi, Finland: Geological Survey of Finland Special Paper 17, p. 317-322.
- Bornhorst, T.J.**, and Johnson, R.C., 1993, Geology of volcanic rocks in the southern half of the Archean Ishpeming greenstone belt, Michigan: U. S. Geological Survey Bulletin 1904-P, 13p.
- Wilkin, R.T., and **Bornhorst, T.J.**, 1993, Archean appinites from the northern complex, Michigan: *Journal of Geology*, v. 101, p. 107-114.
- Rasilainen, K., Nurmi, P.A., and **Bornhorst, T.J.**, 1993, Rock geochemical implications for gold exploration in the Late Archean Hattu schist belt, Iiomantsi, eastern Finland: Geological Survey of Finland Special Paper 17, p. 353-362.
- Wilkin, R.T., and **Bornhorst, T.J.**, 1992, Geology and geochemistry of granitoid rocks in the Archean northern complex, Michigan, U.S.A.: *Canadian Journal of Earth Sciences*, v. 29, p. 1674-1685.
- Bornhorst, T.J.**, 1992, Relationship between native copper deposits and tectonic development of the North American Midcontinent rift system: 10th International Basement Tectonics Conference Program with Abstracts, p. 191-193.
- Bornhorst, T.J.**, 1992, An overview of the Keweenaw Peninsula native copper district, Michigan: Society of Economic Geologists Guidebook Series, v. 13, p. 33-62.

- Bornhorst, T.J.** and Whiteman, R.C., 1992, The Caledonia native copper mine, Michigan, Society of Economic Geologists Guidebook Series, v. 13, p. 139-144.
- Bornhorst, T.J.**, 1992, Road log of bedrock geology and native copper deposits of the Keweenaw Peninsula, Michigan: Society of Economic Geologists Guidebook Series, v. 13, p. 105-138.
- Bornhorst, T.J.** and McDowell, S.D., 1992, Michigan Tech Earth Science Laboratory and Experimental Mine connecting with the Quincy Native Copper Mine, Michigan: Society of Economic Geologists Guidebook Series, v. 13, p. 100-104.
- Bornhorst, T.J.**, 1992, Keweenaw Peninsula: in South Flank of Mid-Proterozoic Midcontinent Rift and Archean and Lower Proterozoic Basement, Wisconsin and Michigan, editor J.C. Green, 10th International Basement Tectonics Conference Field Trip Guidebook, p. 42-69.
- Blaske, A.R., **Bornhorst, T.J.**, Brady, J.M., Marsh, T.M., McKittrick, S.A., 1991, The Shumake volcanic dome-hosted epithermal, precious metal deposit, western Mojave Desert, California: Economic Geology, v. 86, p. 1646-1656.
- Johnson, R.C., and **Bornhorst, T.J.**, 1991, Archean geology of the northern block of the Ishpeming greenstone belt, Marquette County, Michigan: U. S. Geological Survey Bulletin 1904-F, p. F1-F20.
- Bornhorst, T.J.**, 1991, Copper deposits and host rocks, western Upper Peninsula of Michigan: Minnesota Geological Survey Information Circular 34, p. 64-72 (Proceedings of U.S.A.-U.S.S.R.-Canada Joint Seminar on Precambrian geology of the southern Canadian shield and the eastern Baltic Shield held August, 1990, Duluth, Minnesota).
- Bornhorst, T.J.**, 1989, A field guide to the Keweenaw Peninsula native copper district: Society of Economic Geologists Fall Field Conference Guidebook, October 1-5, 1989, p. 116-141.
- Bornhorst, T.J.**, Kalliokoski, J., Paces, J.B., and Rose, W.I., Jr., 1989, Stops 30 to 40: Lake Superior Basin Segment of the Mid-Continent Rift System: 28th International Geological Congress, Field Trip Guide Book T344, p. T344-43-T344-51 (published by American Geophysical Union).
- Bornhorst, T.J.**, 1988, Character of mid-Cenozoic andesites, basaltic andesites and related volcanic rocks, Mogollon-Datil volcanic field, southwestern New Mexico: Colorado School of Mines Quarterly, v. 83, no. 1, p. 1-13.
- Bornhorst, T.J.**, Paces, J.B., Grant, N.K., Obradovich, J.D. and Huber, N.K., 1988, Age of native copper mineralization, Keweenaw Peninsula, Michigan: Economic Geology, v. 83, p. 619-625.
- Bornhorst, T.J.**, 1988, Granophile elements in mid-Cenozoic calc-alkalic rhyolitic volcanic rocks, Mogollon-Datil volcanic field, southwestern New Mexico: Canadian Institute of Mining, Special Volume 39, p. 331-341.
- Bornhorst, T.J.**, 1988, Geological overview of the Marquette greenstone belt, Michigan: 34th Annual Insititue on Lake Superior Geology, Field Trip Guidebooks, v. 34, p. A1-A18.

- Diehl, J.F., McClannahan, K.M., and **Bornhorst, T.J.**, 1988, Paleomagnetic results from the Mogollon-Datil volcanic field, southwestern New Mexico and a mid-Tertiary reference pole for North America: *Journal of Geophysical Research*, v. 93, p. 4869-4879.
- Li, G., Whitten, E.H.T., **Bornhorst, T.J.**, and Hicks, D.L., 1988, Subdivision among samples on the basis of numerous variables: *The Compass of Sigma Gamma Epsilon*, v. 66, no. 1, p. 7-14.
- Halsor, S.P., **Bornhorst, T.J.**, Strowd, W., Beebe, M. and Richardson, K., 1988, The geology of the DeLamar Silver Mine, Idaho - A volcanic dome complex and genetically associated hydrothermal system: *Economic Geology*, v. 83, p. 1159-1169.
- Bornhorst, T.J.**, 1988, Road Log Stops 7, 9, 10, and 14: in Upper Keweenawan rift-fill sequence, mid-continent rift system, Michigan: *Michigan Basin Geological Society 1988 Fall Field Trip Guidebook*, p. 53-60, 69-70.
- Bornhorst, T.J.**, Baxter, D.A., MacLellan, M.L., and Johnson, R.C., 1988, Geological field trip to the Marquette Greenstone Belt: Part I, Day 1 Road Log - Stops 1 to 11: *Institute on Lake Superior Geology, Field Trip Guidebooks*, v. 34, Part 2, p. A54-A64.
- Bornhorst, T.J.** and Baxter, D.A., 1988, Geological field trip to the Marquette Greenstone Belt: Part II, Day 2 Road Log - Stops A to E: *Institute on Lake Superior Geology, Field Trip Guidebooks*, v. 34, Part 2, p. A65-A71.
- Green, J.C., **Bornhorst, T.J.**, Chandler, V.W., Mudrey, M.G., Jr., Myers, D.E., Pesonen, L., and Wilband, J.T., 1987, Late-middle Proterozoic (Keweenawan) dykes of the western Lake Superior region: Evidence for evolution of the North American midcontinent rift: *Geological Association of Canada Special Paper 34*, p. 289-302.
- Tilling, R.I., **Bornhorst, T.J.**, Taggart, J.E., Jr., Rose, W.I., and McGee, J.J., 1987, Inter-laboratory comparisons of X-ray fluorescence analyses of eruptive products of El Chichon volcano, Chiapas, Mexico: *Applied Geochemistry*, v. 2, p. 337-345.
- Rose, W.I., Jr., Newhall, C.G., **Bornhorst, T.J.**, and Self, S., 1987, Quaternary silicic pyroclastic deposits of Atitlan caldera, Guatemala: *Journal of Volcanology and Geothermal Research*, v. 33, p. 57-80.
- Whitten, E.H.T., Li, G., **Bornhorst, T.J.**, Christenson, P., and Hicks, D.L., 1987, Quantitative recognition of granitoid suites within batholiths and other igneous assemblages: in *Use and Abuse of Statistical Methods in the Earth Sciences*, International Association of Mathematical Geology, *Studies in Mathematical Geology*, No. 1, p. 55-73.
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- Bornhorst, T.J.** and Rose, W.I., Jr., 1986, Partitioning of gold in young calc-alkalic volcanic rocks from Guatemala: *Journal of Geology*, v. 94, p. 412-418.
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Bornhorst, T. J. and Barron, R. J., 2016, Discovery and geology of lake copper, Keweenaw Peninsula, Michigan: A. E. Seaman Mineral Museum, Web Publication 2, 6p.

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PUBLISHED ABSTRACTS: ~120 total

RESEARCH ADVISEMENT

Chairperson (and Co-Chair) Completed: 25 M.S. Theses, 4 Ph.D. Dissertations.

Committee Member Completed (does not include those chaired): 48 M.S. Theses, 12 Ph.D. Dissertations
(2 European Ph.D. committees)

"Senior" Independent Research Projects Completed: 29

SELECTED RECENT ACTIVITIES SUPPORTING THE A. E. SEAMAN MINERAL

(not covered elsewhere)

Principal leader of a 1.5 day geological and historical field trip to the Keweenaw Peninsula for the dedication of a new State of Michigan historical marker honoring Douglass Houghton, September 2016.

Invited presentation at the 6th annual Dallas mineral collecting symposium, August 2016.

Presentation at the annual national meeting of the Geological Society of America in Baltimore, Maryland on the Michigan Mineral Alliance. Co-authored a presentation on copper isotopes that was presented by Kei Ikehata from University of Tsukuba, Japan and another on the Western Syncline Copper Deposit, Michigan," that was presented by William Williams, Metallorum LLC, Brookline, PA, November 2015

Successful negotiation of the Michigan Mineral Alliance, an agreement between the University of Michigan and Michigan Technological University to preserve the legacy of the University of Michigan mineral collection. The unique arrangement provides for shared responsibility and co-ownership of the University of Michigan mineral collection. The museum will curate and exhibit the collection at its home on the campus of Michigan Tech, May 2015.

Invited presentation to the international Fluorescent Mineral Society on the museum's fluorescent mineral exhibit in Tucson, Arizona, February 2014

Special copper island exhibit with 3 large standalone cases including a 450-pound mass of native copper, a 200-pound specimen of native copper spires extending into an open cavity and three larger museum crystallized copper specimens at the 59th Tucson Gem and Mineral Show, February 2013 and at the 69th Annual Greater Detroit Gem, Mineral, and Fossil Show, October 2013

Invited banquet speaker and field trip leader for the 6th Annual Precambrian Research Center Professional Development Workshop Series Short Course, Duluth, Minnesota, October 2013

Novel featured exhibitor of a 450-pound mass of native copper at the 45th Annual Denver Gem and Mineral Show, October 2012

Grant of \$2,000 from the internationally recognized Mining and Metallurgical Society of America for design of a use of minerals exhibit, November 2009

Invited speaker at the 44th Annual Gem, Mineral, Fossil and Jewelry Show of Greater Cincinnati, Ohio, May 2009

Featured invited evening program speaker at the Westward Look Show that is part of the event associated with the Tucson Gem and Mineral Show, February 2007