## **CURRICULUM VITAE**

## Andrew W. Macfarlane

Address: Department of Geology Florida International University 107th Avenue/University Park Miami, FL 33199

Work phone: (305) 348-3980 Home phone: (305) 247-5685 Fax: (305) 348-3877 e-mail: macfarla@fiu.edu

Born: December 17, 1960, in Lancaster, California.

Marital status: Married, one child.

Education:

- Ph.D., Harvard University, September 1983--November 1989. Dissertation title: "Lead, strontium and sulfur isotopes in the Hualgayoc area, Perú, and lead isotope provinces of the Central Andes."
- B.S., Oregon State University, September 1979-June 1983, with highest honors. Majored in Geology with a minor in English.

*Employment:* 

- Associate professor of economic geology and geochemistry (tenured), Florida International University, 8/96-present.
- Research associate, Center for Materials Research in Archaeology and Ethnology (CMRAE), Massachussetts Institute of Technology, 7/95-present.
- Assistant professor of economic geology and geochemistry, Florida International University, 9/91-7/96
- Postdoctoral research fellow in the Department of Earth and Planetary Sciences, Harvard University, 9/89-9/91.
- Predoctoral research fellow in the Department of Materials Science, Center for Materials Research in Archeology and Ethnology, MIT, 1/89-7/89.
- Research fellow in the Department of Earth and Planetary Science, Harvard University, 7/86-12/88.
- Teaching fellow in the Department of Earth and Planetary Science, Harvard University, 1/85-6/86.
- Research fellow in the Department of Earth and Planetary Science, Harvard University, 9/83-12/84.

Refereed publications:

- Macfarlane, A.W. and Lechtman, H.N., 2014, Andean ores, bronze artifacts and lead isotopes: constraints on metal sources in their geological context: J. Archaeological Method and Theory, DOI 10.1007/s10816-014-9225-8 (online publication, print edition will appear in early 2015).
- Potra, A., Hickey-Vargas, R., Macfarlane, A.W. and Salters, V.J.M., 2014, Pb, Sr, and Nd isotopic characteristics of a variety of lithologies from the Guerrero composite terrane,

west-central Mexico: constraints on their origin: Rev. Mexicana de Ciencias Geológicas, v. 31, p. 203-220.

- Potra, A. and Macfarlane, A.W., 2014, Lead isotope studies of the Guerrero composite terrane, west-central Mexico: implications for ore genesis: Mineralium Deposita, v. 49, p. 101-117.
- Panneerselvam, K., Macfarlane, A.W. and Salters, V.J.M., 2012, Reconnaissance lead isotope characteristics of the Blackbird deposit: Implications for the age and origin of Cobalt-Copper mineralization in the Idaho Cobalt Belt, United States: Economic Geology, v. 107, p. 1177-1188.
- Lechtman, H., Cruz, P., Macfarlane, A. and Carter, S., 2010, Metal processing during the middle horizon in the south Andean Altiplano (Escaramayu, Pulacayo, Potosí, Bolivia), Ból. Museo Chileno de Arte Precolombino, v. 15, p. 9-27.
- Panneerselvam, K., Macfarlane, A.W. and Salters, V.J.M., 2006, Provenance of ore metals in base and precious metal deposits of central Idaho as inferred from lead isotopes: Economic Geology, v. 101, pp. 1063-1077.
- Lechtman, H., and Macfarlane, A.W., 2006, Bronce y redes de intercambio andino durante el Horizonte Medio: Tiwanaku y San Pedro de Atacama: *in* Esferas de Interacción Prehistóricas y Fronteras Nacionales Modernas: los Andes sur centrales, Lechtman, H., ed., Institute of Andean Research, p. 503-539.
- Lechtman, H.N. and Macfarlane, A.W., 2005, La metalurgia del bronce in los Andes sur centrales: Tiwanaku y San Pedro de Atacama: Estudios Atacameños; v. 30, p. 7-28.
- Macfarlane, A. W. and Kamenov, G., 2002., Sources of lead in the San Cristobal, Pulacayo and Potosí mining districts, Bolivia, and a reevaluation of regional ore lead isotope provinces: Econ. Geol., v. 97, p. 573-592.
- Kamenov, G., Macfarlane, A.W. and Riciputi, L., 2001, A lead isotope investigation of the metal sources of the San Cristobal, Pulacayo and Potosí mining districts, Bolivia: implications for regional metal provenance: Economic Geology, v. 97, p. 573-592.
- Arfstrom, C., Macfarlane, A.W. and Jones, R.J., 2000, Distributions of Mercury and Phosphorous in Everglades soil from Water Conservation Area 3A, Florida, USA: Water, Air and Soil Pollution, v. 121, p. 133-159.
- Macfarlane, A.W., 1999, The lead isotope method for tracing the sources of metal in archaeological artifacts: strengths, weaknesses and applications in the Western Hemisphere: Metals in Antiquity, BAR International Series 792, p. 310-316.
- Macfarlane, A.W., 1999, Isotopic studies of northern Andean crustal evolution and ore metal sources, *in* Geology and Ore Deposits of the Central Andes, Skinner, B.J. ed., Society of Economic Geologists Spec. Pub. #7, Ch. 6, p. 195-217.
- Macfarlane, A.W., Tosdal, R.M., Vidal, C. and Paredes, J., 1999, Geologic and isotopic constraints on the age and origin of auriferous-quartz veins in the Parcoy mining district, Pataz, Perú, *in* Geology and Ore Deposits of the Central Andes, Skinner, B.J. ed., Society of Economic Geologists Spec. Pub. #7, Ch. 10, p. 267-279.
- Hosler, D. and Macfarlane, A.W., 1996, Copper sources, metal production and metals trade in Late Postclassic Mesoamerica: Science, v. 273, p.1814-1819.
- Vidal, C., Macfarlane, A.W. and Tosdal, R.M., 1996, Geología y metalogenia del distrito minero Parcoy en la provincia aurifera de Pataz, La Libertad: Bol. Soc. Geol. Peru, v. 85.
- Sen, G., Macfarlane, A.W. and Srimal, N., 1995, Significance of rare hydrous alkaline melts in Hawaiian xenoliths: Cont. Min. Pet. v. 122, p. 415-427.

- Macfarlane, A.W., Prol-Ledesma, R.-M. and Conrad, M.D., 1994, Isotope and fluid inclusion studies of the geological and hydrothermal evolution of the Hualgayoc district, northern Peru: the provenance of hydrothermal elements: Internat. Geol. Rev. 36, p. 645-677.
- Macfarlane, A.W., Danielson, A., Holland, H.D. and Jacobsen, S.B., 1994, REE chemistry and Sm-Nd systematics of late Archean weathering profiles in the Fortescue Group, Pilbara Block, Western Australia, Geochim. Cosmochim. Acta 58, p. 1777-1794.
- Macfarlane, A.W., Danielson, A., and Holland, H.D., 1994, Geology and major and trace element chemistry of late Archean weathering profiles in the Fortescue Group, Pilbara Block, Western Australia: implications for atmospheric P<sub>O2</sub>: Precambrian Research, v.

65, p. 297-317.

- Macfarlane, A.W. and Holland, H.D., 1991, The timing of alkali metasomatism in paleosols: Can. Mineral., v. 29, p. 1043-1050.
- Macfarlane, A.W., and Shimizu, N., 1991, SIMS measurements of <sup>34</sup>S in coexisting vein and stratabound sulfide ores: Geochim. Cosmochim. Acta, v. 55, no.2. p. 525-541.
- Macfarlane, A.W., Marcet, P., LeHuray, A.P., and Petersen, U., 1990, Lead isotopic provinces of the central Andes inferred from ores and crustal rocks: Economic Geology, v. 85, no. 8, p. 1857-1880.
- Macfarlane, A.W., and Petersen, U., 1990, Pb isotopes of the Hualgayoc area, northern Perú: implications for metal provenance and genesis of a Cordilleran polymetallic mining district: Economic Geology, v. 85, no. 7, p. 1303-1327.
- Prol-Ledesma, R.M. and Macfarlane, A.W., 1989, Fluid inclusion evidence of the evolution of mineralizing fluids in the Hualgayoc District, Perú: XI New Zealand Geothermal Workshop, Auckland, NZ, extended abstract, p. 155-158.
- Macfarlane, A.W., 1988, Isótopos de Plomo en el distrito minero de Hualgayoc (Spanish): Bol. Soc. Geol. del Perú, v. 78, pp. 81-86.

### Reports and non-refereed publications

- Potra, A., Macfarlane, A.W. and Hickey-Vargas, R., 2013, Lead isotope trends and metal sources in SW Mexican deposits: GSA Abstracts with Programs, v. 45, p. 725, Denver, Oct. 27-30.
- Potra, A., Hickey-Vargas, R., Macfarlane, A.W. and Salters, V.J.M., 2012, Lead strontium and neodymium isotope constraints on the origin of the Guerrero composite terrane, west-central Mexico: GSA Abstracts with Programs, v. 44, p. 281, Charlotte, Nov. 5.
- Postra, A, Macfarlane, A.W., Salters, V.J. and Sachi-Kocher, A., 2010, Isotopic studies of the Guerrero composite terrane, west-central Mexico: Implications for provenance of crustal rocks and ore metals: AGU Fall meeting, abstract # V23B-2419.
- Potra, A. and Macfarlane, A.W., 2009, Ore metals sources in Tertiary mineral deposits of the Guerrero and Sierra Madre terranes, Mexico, as inferred from lead isotope studies: GSA Abstracts with Programs, v. 41, p. 438, Portland, Oct. 18-21.
- Stalker, J.C., Price, R.M. and Macfarlane, A.W., Geochemical investigation of the surface water and groundwater in the immediate vicinity of Florida Power and Light Turkey Point Cooling Canals: Initial report, June 16, 2009. 38pp.
- Potra, A. and Macfarlane, A.W., 2008, Lead isotope constraints on the sources of ore metals in deposits from the Guerrero Terrane, west-central Mexico: GSA Abstracts with Programs, v. 40, p. 135, Houston, TX, October 8.

- Potra, A. and Macfarlane, A.W., 2007, Lead isotope constraints on the sources of ore metals in SW Mexican deposits: AGU Fall meeting, abstract #V41D-0818.
- Macfarlane, A.W., Kamenov, G. and Riciputi, L., 2001, Leaching of lead from Andean Paleozoic sedimentary rocks: implications for metal sources of giant silver deposits. GSA Annual Meeting.
- Kamenov, G., Macfarlane, A.W. and Riciputi, L., 2001, Metal sources in the San Cristobal mining district southwest Bolivia: a lead isotope study: 11<sup>th</sup> Annual V.M. Goldschmidt Conference, May 20-24, Reston VA.
- Panneerselvam, K., Macfarlane, A.W., Sen, G., and Salters, V.J.M. (2000) Magmatic and hydrothermal evolution of base and precious metal deposits of central Idaho: Pb and S isotope perspective. AGU Spring Meeting, Washington D.C. Not refereed.
- Macfarlane, A.W. and Arfstrom, C., 1999, Variability of Hg and P in Everglades southern WCA-3A peat soil cores. In Ninth Annual V.M. Goldschmidt Conference, Cambridge, MA August 22-27, 1999, p. 181. LPI Contribution No. 971, Lunar and Planetary Institute, Houston.
- Selvam, K.P., Macfarlane, A.W., Sen, G., and Salters, V.J. (1999) Highly radiogenic upper crustal rocks of central Idaho and its bearing on ore genesis. In Ninth Annual V.M. Goldschmidt Conference, Cambridge, MA August 22-27, 1999, p. 266. LPI Contribution No. 971, Lunar and Planetary Institute, Houston.
- Vidal, C.E., Paredes, J., Macfarlane, A.W. and Tosdal, R.M., 1996, "Hercynian gold-quartz veins in the Parcoy district of Peru." Abstracts with Programs, v. 1, p. 424, 30th IGC, August 4-14, Beijing, China.
- Macfarlane, A.W., Tosdal, R.M. and Vidal, C.E., 1996, Field and radiogenic isotope evidence for the origin of gold-base metal veins, Parcoy district, Perú: GSA Abs. w/Progs., Denver, CO.
- Gutierrez, G., Macfarlane, A.W., Hickey-Vargas, R., and Blanco, J.A., 1995, Alteración hidrotermal vs. meteorización como causante de los procesos de rubefacción en la discordancia Precámbrico-Cámbrico en el antiforme del Narcea (NW de España): limitacioned geoquímicas.
- Macfarlane, A.W., 1995, Linear arrays in Andean Pb isotope data and the depth of mixing: Geol. Soc. Am. Annual Mtg. (New Orleans) abs. w/prog. v. 27, p. 410. (session chair).
- Macfarlane, A.W., 1994, Sources of lead and other elements in Andean ores: the importance of hydrothermal scavenging (ext. abs). Communicaciones, no. 45, p. 151.
- Conway, F.M., Macfarlane, A.W., Connor, C.B., Lafemina, P.C and Reimer, M., 1994, Degassing at a young cinder cone: Volcan Cerro Negro: GSA Abstracts with Programs, vol. 26, no. 7, p. 555. Seattle, WA.
- Lafemina, P.C., Connor, C.B., Reimer, M., and Lugo, C.M., 1994, Passive degassing at Volcan Telica, Nicaragua: EOS v. 75, no. 44, p. 795. San Fransisco, CA.
- Petersen, U., Macfarlane, A.W. and Danielsen, A., 1993, Lead isotopic provinces in Perú, Bolivia and northern Chile: Second Internat. Symp. on Andean Geodynamics, Oxford, UK, extended abstract, p. 477-480.
- Connor, C.B., Conway, F.M. and Macfarlane, A.W., 1993, Monitoring high-temperature fumaroles on active lava domes: Workshop on Volcanic Disaster Prevention (Palo Alto, CA), extended abstract, p. 156-162.
- Macfarlane, A.W. and Prol-Ledesma, R.-M., 1993, Evolution of the hydrothermal system at Hualgayoc, N. Peru. GSA Annual Meeting, Boston, MA, Oct. 28.

- Sen, G., Macfarlane, A.W. and Srimal, N., 1993, Mantle Metasomes?, GSA Annual Meeting, Boston, MA, Oct. 28.
- Macfarlane, A.W., Danielson, A. and Holland, H.D., 1992, Geology and chemistry of late Archean weathering profiles in the Fortescue Group, Western Australia: Geol. Soc. Am. Annual Mtg. (Oct. 26-29, Cincinnati, OH) abs. w/prog v. 24, p. 285.
- Macfarlane, A.W., Danielson, A. and Holland, H.D., 1992, Mobility of the REE during soil formation in the Archean: V.M. Goldschmidt Conf., Reston, VA., May 8-10, p. A-66.
- Macfarlane, A.W. and Holland. H.D., 1990, Paleoweathering of the Mt. Roe basalt, Fortescue Group and the oxygen content of the late Archean atmosphere: Proc. Third International Archean Symposium, Sept. 1990, Perth, WA, extended abstract, p. 289-291.
- Macfarlane, A.W. and Shimizu, N., 1989, Sulfur isotope ratios in vein and stratabound ore sulfides, Hualgayoc District, Perú: Geol. Soc. Am. Ann. Mtg. (St. Louis), Abs. with Progs. vol. 21, p. 360.
- Macfarlane, A.W., 1988, Pb isotopes in supracrustal rocks and their bearing on ore metal sources, Hualgayoc District, N. Peruvian Andes: Geol. Soc. Am. Ann. Mtg. (Denver), Abs. with Progs. vol. 20, no. 7, p. 302.
- Macfarlane, A.W., 1987, Pb isotope ratios from the ores of the Hualgayoc district, northern Peru: EOS, v. 68, p. 440.
- Macfarlane, A.W., and Petersen, U., 1987, Veins and mantos of the Hualgayoc District, northern Peru: Geol. Soc. Am. Ann. Mtg. (Phoenix), Abs. with Progs. vol. 19, no. 7, p. 753.
- Marcet, Pablo, Petersen, Ulrich, and Macfarlane, Andrew W., 1987, Lead isotopic compositions of Andean ores--implications of generic variability: Geol. Soc. Am. Ann. Mtg. (Phoenix), Abs. with Progs. vol. 19, no. 7, p. 760.

Research Interests:

Provenance of elements, especially metals, in hydrothermal systems, and implications for models of ore genesis.

Provenance of metals used in pre-Columbian metallurgy in southern Mexico and the central Andes.

Evolution of ore-forming fluids in magmatic systems.

Sources of mercury and lead in Everglades peat soils.

Evolution of the oxygen content of the earth's atmosphere.

# Graduate Students supervised:

Ph.D. candidates

- Kevin Chau, Whole Rock and Mineral Chemistry from Rocks of the Central Atlantic Magmatic Province
- Sven Holbik, Arc Crust-Magma Interaction in the Andean Southern Volcanic Zone from Thermobarometry, Mineral Composition, Radiogenic Isotope and Rare Earth Element Systematics of the Azufre-Planchon-Peteroa Volcanic Complex, Chile
- Indra Sen, Investigation of Mantle Dynamics from Platinum Group Elements and Rhenium-Osmium Isotope Systematics of Mantle Xenoliths from Oahu
- Julie Johnson, A Geochemical Study of Crustal Plutonic Rocks from the Southern Mariana Trench Forearc: Relationship to Volcanic Rocks Erupted during Subduction Initiation
- Susan Wacaster

- Adriana Potra (committee chair), Isotopic studies of the Guerrero composite terrane, west-central **Mexico**: Implications for provenance of crustal rocks and genesis of ore metals
- Ben Naes (Ph.D. student, Forensics Insitute/Dept. of Chemistry), Elemental Analysis of Glass and Ink by Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS) and Laser Induced Breakdown Spectroscopy (LIBS)
- Samantha Evans, Carbon and nitrogen stable isotopic patterns in South Florida coastal ecosystems: Modern and paleoceanographic perspectives
- Melroy Borges, Life cycle of Deccan trap magma chambers: A crystal scale elemental and strontium isotopic investigation
- Sedelia Durand, Experimental studies of the origin of Colombia River Plateau flood basalts.
- Shantanu Keshav, An investigation into the Hawaiian mantle from a xenolith perspective. Degree awarded Summer 2003.
- K. Panneerselvam (committee chair): Sources of metals and sulfur in central Idaho ore deposits. Degree awarded Fall 2001.
- Murong Sun, Geochemical variation among small eruptive centers in the central SVZ of the Andes: an evaluation of subduction, mantle and crustal influences. Degree awarded Spring 2001.

#### M.S. candidates

Kimberly Beck

- Kevin Chau
- Raul Brens
- Sven Holbik
- Tiffany McKelvey
- David Velez (committee chair): Application of AVARIS hyperspectral imagery to ore alteration zoning and mineral exploration.
- Andrea Hobbs: Elemental profiling of forensic automotive paint samples by laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS and laser induced breakdown spectrometry (LIBS). Degree awarded Summer 2003.
- George Kamenov (committee chair): Sources of metals in San Cristobal and Pulacayo mining districts, southwest Bolivia: a lead isotope study. Completed Fall 2000.
- Amitava Gangopadhyay: An experimental petrologic study of basalts from selected formations of the Deccan Traps, India. Completed Summer 2000.
- Peter Lafemina (committee chair): Soil gas chemistry near passively degassing active volcanoes. Completed 1997.
- Bob Merkel. Sediment and element accumulation in Everglades excavations. Completed Fall 1997.
- Cleone Arfstrom (committee chair): Spatial distributions of mercury and phosphorous in soils from Water Conservation Area 3A, Everglades. Completed 1996.
- Alireza Malek: Gravity and magnetic anomalies near Homestead, Florida. Project completed Summer 1994.
- John Arfstrom (committee chair): A model of the hydrothermal system at Casa Diablo in Long Valley, California, based on resistivity profiles and soil Mercury analyses. Project completed Spring 1994.

Goutam Mandal: Geochemical characteristics of volcanic rocks from the West Mariana Ridge. Project completed spring 1992.

## Undergraduate Teaching

GLY 1010 Introduction to Earth Science
GEO 3510 Earth Resources (In class and fully online sections)
GLY 3782 Field Excursion
GLY 4300 Petrology
EVR 4310 Energy Resources
GLY 4812 Introduction to Ore Deposits
GLY 4910 Undergraduate Research

Graduate Teaching GLY 5782 Advanced Field Excursion GLY 5816 Economic Geology GLY 6809 Hydrothermal Geochemistry GLY 6970 Geology Honors Thesis GLY 7980 Dissertation

Grants		
NSF	\$70,000	"Structure of active fumarole fields: an integrated
		geophysical and geochemical approach." Submitted
		as co-P.I. with Charles Connor.
NSF	\$3,000	Supplement to "Structure of active fumarole fields:
		an integrated geophysical and geochemical
	*	approach."
Placer Internat. Exploration	\$18,000	"Fluid sources and evolution of the La Coipa silver-
		gold system, Chile"
Expl. Peñoles, S.A. de C.V.	\$8,000	"Field studies and sampling of active and
		archchaeological mining sites in southern Mexico"
Aspec, Inc.	\$2,000	"Field studies and sampling of the Precambrian
		Mararaiso Massif and associated mineralization."
FIU development grants	\$4,500	Requests for travel and analytical costs.
FIU seed money grant	\$2,000	"Uplift and tectonics of the Himalaya of NE India."
NSF	\$8,700	"Relocation of a thermal ionization mass
		spectrometer to Florida International University"
Wenner-Gren Foundation	\$16,353	"Bronze and Andean Exchange Networks During
		the Middle Horizon" co-PI
NSF-CHE	\$582,806	"Acquisition of a High Resolution Inductively
		Coupled Plasma Mass Spectrometer for Research in
		Chemistry, Environmental Sciences, Earth Sciences
		and Forensic Sciences," co-PI
S. FL Water Mgmt. Dist.	\$25,398	Characterization and identification of source waters
		contributing to the groundwater and surface waters
		in the vicinity of the Florida Power and Light,

Turkey Point cooling canal system, South Miami-Dade, Florida.