

Marcos Zentilli - van Kilsdonk

Marcos Zentilli, PhD, PGeo

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PERSONAL

Born: Santiago, Chile, 31-May-1940
Married to Armgard Raczynski von Oppen
3 married daughters, 4 grandchildren, living in Canada
Dual Citizenship: Chile and Canada (since 1975).

EDUCATION/Training

Degree	Year	Discipline/Field	Institution/Country
High School	1957	<i>Bachiller en Humanidades;</i> Mathematics & Physics	<i>Instituto Nacional, Santiago, Chile</i>
<i>Geólogo</i>	1963	Mining Geology	Universidad de Chile, Santiago
Graduate Studies	1964-65	Geology - Mineral Deposits	<i>Ludwig – Maximilians - Uni-</i> <i>versität München, Germany</i>
PhD	1974	Geology - Metallogensis, Tectonics - Geochronology	Queen's University, Kingston, Ontario, Canada
Post-Doctoral	1978-79	Isotope geochemistry	USGS Denver Fed. Center, USA
Post-Doctoral	1986-97	Trace element geochemistry	Univ. of Montpellier, France
Private Pilot	1962	Single engine	Club Aéreo Tobalaba, Chile

LANGUAGES: English (Spoken Read Written), Spanish (SRW), French (SR), German (SR)

SUMMARY

After working as exploration geologist for industry and regional geological mapping for the Geological Survey of Chile (now SERNAGEOMIN), Dr. Zentilli joined Dalhousie University, Halifax, Canada in 1973, where he taught the geology of mineral deposits and carried out research on metallogeny, isotope geology and geochronology. He developed the first Canadian low-temperature thermochronology laboratory using the apatite fission-track technique, and applied it to the Central Andes and Atlantic and Arctic Canada. He was Chair of Earth Sciences 1984-1986, and contributed to the Canadian Studies program in the Faculty of Arts and Social Sciences for several years. He directed more than 20 PhD and 20 MSc, and over 55 BSc (Honours) theses. In 1985, Chilean and British volcanologists baptised Zentilli Volcano in the High Andes, in recognition of his earlier work in the area. He retired in 2005 and continues to be active as Professor Emeritus at Dalhousie University, and as international consultant for MZGeoscience Inc. In 2010 he was appointed Honorary Consul of Chile in Halifax by decree of President Michelle Bachelet.

EMPLOYMENT HISTORY

- **Resident Geologist**, Copiapó, Atacama Province, (I.I.G.) Geological Survey of Chile 1964 – 1968
- **Exploration Geologist**, Clarenville, Newfoundland, Geophysical Engineering Ltd.(Teck) 1972
- **Assistant and Associate Professor**, Earth Sciences, Dalhousie University 1973 - 1980 – 1986
- **Chairman**, Earth Sciences, Dalhousie University 1984 - 1986
- **Scientific Director**, Fission Track Research Laboratory, Dalhousie University 1987 -2005
- **Visiting Professor**, University of Montpellier, France, 1986-1987
- **Visiting Scientist**, Solid Source Mass Spectrometry Laboratory (c/o Dr. Bruce Doe); U.S. Geological Survey, Denver General Center, and Colorado School of Mines, Golden, Co, USA, 1978-1979
- **Professor of Geology**, Earth Sciences, Dalhousie University 1986 – 2005
- **Emeritus Professor**, Dalhousie University, July 2005 – present
- **Vice-President (Research)**, Cuesta Research Ltd. 1985 - 2001
- **President and CEO**, MZ Geoscience Inc. 2010-present
- **Honorary Consul of Chile for Atlantic Canada (NS, NB, PE, NL), in Halifax**, 2010-present

RECOGNITION OR AWARDS

- **Gesner Medal - 2015** - Distinguished Scientist Award - from Atlantic Geoscience Society (AGS).
- **Appointed Technical Expert (Minerals)** to Volunteer Panel, Natural Resources Strategy for Nova Scotia, 2009-2010
- **Vice-President, Society of Economic Geologists**, Colorado, USA, 2007
- **NSERC**: Awarded Operating or Discovery Research grants from Natural Sciences and Engineering Research Council of Canada without interruption from 1974 to 2011, and conferred several Industry-NSERC research grants
- **Julian Boldy Award 1997** - Mineral Deposits Division - for Best Technical Paper Presented at the 1997 Annual Meeting of Geological Association of Canada, May 1997, Ottawa, Canada
- **Student Affairs Committee**, Society of Economic Geologists (SEG), 1999 -2002
- **Treasurer, The Association of Professional Geoscientists** of Nova Scotia, 2005 -2010
- **Chair, Northeastern Section, Geological Society of America Meeting in Halifax**, N.S., March 2003
- **City of Halifax - Ambassador Award 2003**, in recognition for attracting and chairing International Meeting of Geological Society of America, NE Section.
- **Member**, Grants Selection Committee, NSERC, 2005-2006
- **Associate Director**, Lester Pearson Institute for International Development, Dalhousie U, 1984 - 1986
- **International Geological Correlation Programme (IGCP)** Canadian National Committee 2000-2008
- **International Co-Leader IGCP/UNESCO Project 342: Age and Isotopes of S.American Ores** (1992-1997)
- **Lecturer**, XVI International Course in Metallogeny, Universidad Central de Ecuador. June 1997.
- **Associate Editor, Andean Geology** (ISSN: 0718-7106) ~1995 - present
- **Member of Editorial Board**, International Geology Review ~1995 – 2012 (ISSN 0020-6814)
- **Guest Editor**, Exploration and Mining Geology 1999; Issue on Latin American Ore Deposits
- **Guest Editor**, Atlantic Geology, Issues dedicated to Environmental Geology: 1997, 2006
- **NSERC Grants Selection Committee (Committee #8 Solid Earth Sciences)** 1984-1986
- **Short Course on Thermochronology**, sponsored by the Isotope Science Division, Geological Association of Canada, GAC/MAC/CSPG Halifax 2005, May 14-18, 2005.
- **Second Vice-President**, The Dalhousie Faculty Association 2001 -2002
- **Invited International Professor**, Doctoral Program, Universidad Católica del Norte, Antofagasta, Chile
- **Workshop on Porphyry Copper Deposits**, 2000 University of New Brunswick,
- **1999 Earth Sciences Professor of the Year**, Department of Earth Sciences, Dalhousie University
- **Marcos Zentilli** (1994-1997) MDD Director, Geological Association of Canada

- **Volcán Zentilli** named in Chile-Argentina border (Tectonophysics, 1985, volume 112, 423-444; also Book 1995 Volcanes de Chile, Instituto Geográfico Militar, Chile, ISBN: 956-202-054-1)
- **Zentilli credited with discovery of Volcán Copiapó gold epithermal porphyry deposit** with “9,773,000 ounces of gold” e.g. Pressacco, R., Gowans, R. & Shoemaker, S. (2009) MICON Report, 147 p.
- **NSERC Postgraduate Scholarship**, 1969-1972
- **McLaughlin Fellowship**, Queen’s University, 1968-1969
- **Queen’s University Graduate Honour Roll** 1969, 1970
- **The German Academic Exchange Service (DAAD) Scholarship**, 1964-1965
- **Beca del Rector, Universidad de Chile**, 1958

RECENT PROFESSIONAL ACTIVITIES (2010 -2015 ONLY)

- **Informal Seminar:** Hot legacy of Dalhousie’s deep drilling in Iceland 40 years ago, Oct. 26, 2018
- **Course Taught:** Geology and Society, for Seniors College Association of Nova Scotia (SCANS); January-March 2018.
- **Invited Talk:** The Rise of Mountains & Climate Changes in the Canadian Arctic Archipelago. Nova Scotia Institute of Science, NS Museum of Natural History, March 5, 2018.
- **Informal Seminar:** Double Visit to a Triple Junction: Chilean Patagonia in 1963 and 2016. Department of Earth Sciences, Dalhousie University, October 7, 2016
- **Presentation:** “Superimposed mineralizing events involved in making giant ore deposits: Evolution of the telescoped Chuquicamata porphyry Cu-Mo deposit in Chile”, The Atlantic Geoscience Society (AGS) 41st Colloquium, 30-31 January, **2015** Mount Allison University, Sackville, New Brunswick
- **Volunteered Lecture:** “Economic Mineralogy”, Dalhousie University, 12-02-2015
- **Invited Lecture:** “The Geologist and Porphyry Copper Systems”. Student Chapter, Society of Economic Geologists, Dalhousie University, 10-02-**2015**
- **Invited Lecture:** “El Soldado, a giant *manto* type copper deposit in Chile formed within a degraded petroleum reservoir”. University of Alberta, Edmonton, 24-09-**2014**
- **Volunteered Lecture:** “Metals and Stratigraphy”, Dalhousie University, 28-09-**2014**
- **Guest Lecture:** “Accelerated thrust advance and mountain rise during the Eocene thermal maximum in the Canadian Arctic Archipelago: apatite fission track evidence”. ETH-Swiss Federal Institute of Technology, Zurich, 23-05-**2013**
- **Guest lecture:**” The interaction of arc magmatism with basinal fluids in the concentration of some copper deposits in the Chilean Andes”. ETH- Swiss Federal Institute of Technology, Zurich, 23-05-**2013**.
- **Excursion Leader.** Halifax Field Naturalists: “Purcell’s Cove Quarries: Geology and History”. 15-11-
- **2014.** <http://halifaxfieldnaturalists.ca/hfnWP/wp-content/uploads/2009/06/2014-11-15.jpg>
- **Preparation of Interactive Modules:** “Mineral identification” and “Formation of ore deposits” for Mining Association of Nova Scotia and NSDNR. **2013**
<http://novascotia.ca/natr/meb/pro prospector- videos/video-06b.asp>
- **Professional Geological Report for CODELCO, Chile:** “*Nuevos Antecedentes Geoquímicos y Metalogénicos Yacimiento MMH.*” 151 p. 15-10-**2012**
- **Organizer of Symposium** on the imminent danger of mega earthquake in northern Chile. Antofagasta and Iquique, Chile. June **2011**. Ministerio de Relaciones Exteriores, Chile, and Canadian Embassy in Chile.
- **Organizer of Symposium** on preparedness for mega earthquakes. Vancouver and Sidney, BC. Chile-Canada Program: Earthquakes And Tsunamis – Science And Emergency Management, November 11-12- 13, **2010** External Affairs, Canada and Ministerio de Relaciones Exteriores, Chile.
- **Professional Geological Report for OETR Association, Canada.** Fission Track Pilot Study: Thermal Inversion of the Scotian Margin Final Report (Project 400-150-10-20), 150 p. 30-11-**2010**

MEMBERSHIP IN SOCIETIES

- Society of Economic Geologists (SEG) Fellow.
- Geological Association of Canada (GAC), Fellow
- Atlantic Geoscience Society (AGS)
- International Association for the Genesis of Ore Deposits (IAGOD)
- Geoscientists Nova Scotia (No.39), APGNS
- Sociedad Geologica de Chile (SGC)
- Colegio de Geólogos de Chile (No. 35)
- Halifax Field Naturalists (HFN)
- Nova Scotia Institute of Science (NSIS)

UNIVERSITY THESES

- ZENTILLI, M (1963) **Geología del Distrito Minero de Manganeso de Fragua, Corral Quemado, Provincia de Coquimbo, Chile.** Tesis de grado para obtener el título de Geólogo, Universidad de Chile, 146p.
- ZENTILLI, M (1974) **Geological evolution and Metallogenic relationships in the Andes of Northern Chile between 26° and 29° South.** PhD Thesis, Queen's University, Kingston, Ontario, 446p.

SELECTED PUBLICATIONS (Former Students in Italics)

Recent Abstracts

- ZENTILLI, M, SALAS-OLIVARES, R., *GRAVES, M.C.* (2018) **A unique Sn-bearing Bi-Ag-Sb, polymetallic, epithermal district in the Chilean Andes: Capitana Mine, Tignamar, Arica – relation to the Proterozoic-Paleozoic Belén Metamorphic Complex.** Abstract submitted to XV Chilean Geological Congress, Concepcion, Chile, November 21, 2018.
- ZENTILLI, M., *HELGASON, J.* (2018) **Deep Drilling 1978 into Oceanic Crust in Iceland – Revisited.** Abstract, Atlantic Geoscience Society Colloquium, Feb 4, 2018, Truro, NS.
- ZENTILLI, M., *BORIC, R.*, HEAMAN, L., MATHUR, R. & HANLEY, J. (2015) **New Developments on the Geology of MMH: is it the “missing half” of Chuquicamata?** Extended Abstract, Proceedings, 14th Chilean Geological Congress, Symposium 2, Exploracion Andina: Nuevos Hallazgos y Actualizaciones. La Serena, Chile, October 4 to 8, 2015; 4 p.ded Abstract.
- ZENTILLI, M. (2015) **Reconocimiento geológico y exploración en Aisén: 1962-1963.** Extended Abstract, Proceedings, 14th Chilean Geological Congress, Symponium 8, Historia de la Geologia, La Serena, Chile, October 4 to 8, 2015; 4 p.
- ZENTILLI, M. & *GRAVES, M.C.* (2015) **Superimposed mineralizing events involved in making giant ore deposits: Evolution of the telescoped Chuquicamata porphyry Cu-Mo deposit, Chile.** Abstract, Atlantic Geoscience Society Symposium, Mount Allison University, Sackville, New Brunswick, January 30-31, 2015. Atlantic Geology, Vol. 71, 137-138.

PAPERS

1. ZENTILLI, M., OMELON, C.R., HANLEY, J., LEFORT, D. (2018) **Paleo-hydrothermal predecessor to perennial spring activity in thick permafrost in the Canadian high Arctic, and its relation to deep salt structures: Expedition Fiord, Axel Heiberg Island, Nunavut.** Special issue "Geothermal Systems: Interdisciplinary Approaches for an Effective Exploration", *Geofluids*. *In Press*.
2. ZENTILLI, M., MAKSAEV, V., BORIC, R., & WILSON, J. (2018). **Spatial coincidence and similar geochemistry of Late Triassic and Eocene–Oligocene magmatism in the Andes of northern Chile: evidence from the MMH porphyry type Cu–Mo deposit, Chuquicamata District.** *International Journal of Earth Sciences*, 107(3), 1097-1126.

3. KETTANAH, Y., ZENTILLI, M., HANLEY, J., TWEEDALE, F. (2016) Geological setting and fluid inclusion characteristics of a lead-copper-barium occurrence hosted in a Neoproterozoic mafic sill at Kiatak, Northumberland Island, Northwestern Greenland. *Ore Geology Reviews* 79: 268–287
4. PINGET, M.-C., DOLD, B.S., ZENTILLI, M.; FONTBOTÉ, L (2015) **Reported supergene sphalerite rims at the Chuquicamata porphyry deposit (Northern Chile) revisited: Evidence for a hypogene origin.** *Economic Geology*, v. 110, pp. 253–262.
5. MAKSAEV, V., MUNIZAGA, F., ZENTILLI, M. & CHARRIER, R. (2009) **Fission track thermochronology of Neogene plutons in the Principal Andean Cordillera of central Chile (33–35°S): Implications for tectonic evolution and porphyry Cu-Mo mineralization.** *Andean Geology* 36 (2): 153-171.
6. ZENTILLI, M., COLLINS, P.G., BORIC P., R., WILSON, S.F.J. (2009) **Diagenetic pyrite in the El Soldado stratabound copper deposit: a link with the petroleum system of the Cretaceous basin of central Chile.** Extended Abstract. 12th Chilean Geol. Congress, Santiago, Chile. 22-26 Nov. 2009 S11_054, 5p.
7. ZENTILLI, M., GRIST, A.M. & WILLIAMSON, M- (2008) **The Stolz Thrust and its connection with the Eocene *Metasequoia* Fossil Forest of Axel Heiberg Island, Canadian Arctic Archipelago: Apatite Fission Track Evidence.** In Garver, J.I., and Montorio, M.J. (eds.), *Proceedings from the 11th International Conference on thermochronometry, Anchorage, Alaska, Sept. 2008.* 280-282.
8. JONES, S.F. H. WIELENS, H., WILLIAMSON, M-C. & ZENTILLI, M. (2007) **Impact of magmatism on petroleum systems in the Sverdrup Basin, Canadian Arctic Islands, Nunavut: A numerical modelling study.** *Journal of Petroleum Geology*, Vol. 30(3), July 2007, pp 237-256
9. ZARASVANDI, A., LIAGHAT.S., ZENTILLI, M. & REYNOLDS, P.H. (2007) **⁴⁰Ar/³⁹Ar Geochronology of Alteration and Petrogenesis of Porphyry Copper – Related granitoids in the Darreh-Zerreshk and Ali-Abad area, Central Iran.** *Exploration and Mining Geology*, Vol. 16, Nos. 1–2, p. 11–24.
10. FOX, D., PARSONS, M. & ZENTILLI, M. (2006) **Foreword: Environmental Geoscience Research in the Atlantic Region**, Special Issue, *Atlantic Geology* 127-128.
11. O'BEIRNE-RYAN, A.M. & ZENTILLI, M. (2006) **Weathering of Devonian monzogranites as recorded in the geochemistry of saprolites from the South Mountain Batholith, Nova Scotia, Canada.** *Atlantic Geology*, 42, 151–157
12. CLOUGH, M., ZENTILLI, M., BRODERS, H.G. & NETTE, T. (2006) **Elemental composition of incisors in Nova Scotia moose: evaluation of a population with abnormal incisor breakage.** *Alces*, 09-Volume 42, p.55-64.
13. GRIST, A.M. & ZENTILLI, M. (2006) **Preliminary apatite fission track thermal history modelling of the Nares Strait region of eastern Ellesmere Island and northwestern Greenland**, *Apatite Spaltspuren-Daten: Modellierung der thermischen Entwicklung an den Rändern der Nares Strait auf dem östlichen Ellesmere Island und in NW-Grönland.* *Polarforschung*, 74, 1-3 (2004), 113-127
14. GRIST, A.M. & ZENTILLI, M. (2005) **Insights into the thermal history of the Nares Strait, Kane Basin and Smith Sound region in Canada and Greenland from apatite fission track and (U-Th)/He dating** . *Canadian Journal of Earth Sciences*, 42, 1547–1569
15. MAKSAEV, V., MUNIZAGA, F., MCWILLIAMS, M., FANNING, M., MATHUR, R., RUIZ, J. AND ZENTILLI, M. (2005) **New Chronology for El Teniente, Chilean Andes, from U-Pb, ⁴⁰Ar/³⁹Ar, Re-Os, and Fission- Track Dating: Implications for the Evolution of a Supergiant Porphyry Cu-Mo Deposit.** Chapter 2 in Sillitoe, R.H.; Perello, J.; and Vidal, C.E.(editors) *Andean Metallogeny: New Discoveries, Concepts, and Updates*, *SEG Special Publication* 11, ISBN 1-887483-89-6, 358 p.
16. ZARASVANDI, A., LIAGHAT, S. & ZENTILLI, M. (2005) **Porphyry Copper Deposits and Urumieh- Dokhtar Magmatic Arc, Iran.** In Porter, T.M. (Ed.), *PGC Publishing*, Adelaide, pp 163-184.
17. WILSON, N.S.F & ZENTILLI, M. (2006) **Pyrobitumen Associated with Copper Mineralization from the Uchumi and Talcuna districts, Central Chile.** *International J. of Coal Geology*, 65, 158–

18. **ZENTILLI, M, HARRISON, J.C. & CREALOCK, J. (2006) Neutral buoyancy icebergs in Kane Basin between Arctic Canada and Greenland a threat to northern navigation: Identifying the source and possible links with Arctic warming.** (In) Robert A. Scott and Dennis K. Thurston (Editors) Proceedings of the Fourth International Conference on Arctic Margins, Dartmouth, Nova Scotia, Canada, September 30-October 3, 2003. US Department of the Interior, Minerals Management Service, Anchorage, Alaska, OCS Study, MMS 2006-003, pp 244-248.
19. **ZARASVANDI, A., LIAGHAT, S. & ZENTILLI, M. (2005) Geology of the Darreh-Zerreshk and Ali-Abad Porphyry Copper Deposits, Central Iran.** *International Geology Review*, 47, 620–646
20. **RYAN, R.J., BEIRNE-RYAN, A.M., & ZENTILLI, M. (2005) A rounded cobble that has not traveled far: Incorporation of corestones from saprolites in the South Mountain area of southern Nova Scotia, Canada.** *Sedimentology*, 52, 1109–1121.
21. **ENCINAS A.,MAKSAEV, V., PINTO L, LE ROUX J.P., MUNIZAGA, F. & ZENTILLI, M. (2005) Pliocene lahar deposits in the Coastal Cordillera of central Chile: Implications for uplift, avalanche deposits, and porphyry copper systems in the Main Andean Cordillera.** *Journal of South American Earth Sciences* 20, 369-381.
22. **KRONFELD, J., GODFREY-SMITH, D.I., JOHANNESSEN, D. & ZENTILLI, M. (2004) Uranium series isotopes in the Avon Valley, Nova Scotia.** *Journal of Environmental Radioactivity*, 73, 335-352
23. **ARNOTT, A. M. AND ZENTILLI, M. (2003) The Chuquicamata Intrusive Complex: Its relation to the Fortuna Intrusive Complex, and the role of the Banco Porphyry in the potassic alteration zone.** Extended Abstract, 10th Congreso Geológico Chileno, Concepcion, 1-10.
24. **MAKSAEV, V. & ZENTILLI, M. (1999; © 2000) Fission track thermochronology of the Domeyko Cordillera, Northern Chile: Implications for Andean tectonics and porphyry copper metallogenesis.** *Exploration and Mining Geology*, 8, 65-89.
25. **BORIC, R., HOLMGREN, C. & WILSON, N.S.F. & ZENTILLI, M., (2002) - The Geology of the El Soldado Manto Type Cu (Ag) Deposit, Central Chile; in Porter, T.M. (Ed.), Hydrothermal Iron Oxide Copper- Gold & Related Deposits: A Global Perspective, Volume 2; PGC Publishing, Adelaide, pp 185-205.**
26. **MAKSAEV, V. & ZENTILLI, M. (2002) - Chilean Strata-bound Cu-(Ag) Deposits: An Overview; in Porter, T.M. (Ed.), Hydrothermal Iron Oxide Copper-Gold & Related Deposits: A Global Perspective, Volume 2; PGC Publishing, Adelaide, pp 185-205.**
27. **GLASMACHER, U.A., LOPEZ-MARTINEZ, A., TREMBLAY, A., ZENTILLI, M. & WAGNER, G.A. (2002) Cretaceous to Tertiary Tectono-thermal evolution of the Laurentian margin in Quebec, Canada - Preliminary results.** Proceedings, Fission Track Analysis, Theory and Applications Symposium, Cádiz, Spain, June 4-7, 2002. *Geotemas*, (ISSN 1576-5172) Soc. Geológica de España, 4, pp. 83-87.
28. **OSSANDÓN, G., FRÉRAUT, R. GUSTAFSON, L., LINDSAY, D. & ZENTILLI, M. (2001) Geology of the Chuquicamata mine: A progress report .** *Economic Geology*, 96, 240-270.
29. **GRIST, A.M., & ZENTILLI, M. (2003). Post-Paleocene Cooling in the Southern Canadian Atlantic Region: Evidence from Apatite Fission Track Models.** *Can. Journal of Earth Sciences*, 40, No. 9, 1279-1297.
30. **WILSON, N.S.F., ZENTILLI, M. & SPIRO, B. (2003) A sulfur, carbon, oxygen, and strontium isotope study of the volcanic-hosted El Soldado manto-type copper deposit, Chile: the essential role of bacteria and petroleum.** Scientific Communication, *Economic Geology*, 98, pp. 163-174.
31. **WILSON, N.S.F, ZENTILLI, M., REYNOLDS, P.H. & BORIC, R. (2003) ⁴⁰Ar/³⁹Ar geochronology of K-feldspar from the El Soldado manto-type copper deposit, Chile.** *Chemical Geology. Isotope Geoscience.*, 197, 161-176
32. **O'BEIRNE-RYAN, A.M., & ZENTILLI, M. (2003) Paleoweathered surfaces on granitoids of southern Nova Scotia: paleoenvironmental implications of saprolites.** *Can. Journal of Earth Sciences*, 40, 805-817.
33. **GLASMACHER, U.A., ZENTILLI, M. AND RYAN R. (2003): Nitrogen distribution in Lower Palaeozoic slates/phyllites of the Meguma Supergroup, Nova Scotia, Canada: Implications for Au and Zn-Pb**

- mineralization.** *Chemical Geology*, 194, 297–329.
34. ARNE, D.C., GRIST, A.M., ZENTILLI, M., COLLINS, M., EMBRY, A. & GENTZIS, T. (2002). **Denudation of the Sverdrup Basin during the Tertiary Eurekan Orogeny: Implications for hydrocarbon exploration**, *Basin Research*, Vol. 14, 183-205.
 35. ZENTILLI, M. AND GRIST, A.M. (2002) Fission Track Thermogeochronology Study (pp.94-107). In Jackson, R. et al. (2002) Cruise 2001 Louis S. St Laurent PASSAGES Pathways to the Arctic Seismic Survey and Geoscientific Experiment, Resolute (Nunavut) to Thule (Greenland). *Geological Survey of Canada Open File Report # 4828*, 157p.
 36. ZENTILLI, M. AND HARRISON, J.C. (2002) **Sediment covered iceberg near Cape Hayes, northeast Ellesmere Island: August 17, 2001**. In Jackson, R. et al. (2002) Cruise 2001 Louis S. St Laurent PASSAGES Pathways to the Arctic Seismic Survey and Geoscientific Experiment, Resolute (Nunavut) to Thule (Greenland). *Geological Survey of Canada Open File Report # 4828*, 157p.
 37. MATHUR, R., RUIZ, J., MUNIZAGA, F. & ZENTILLI, M. (2001) **Reply (on Re-Os dating of porphyry copper deposits, Discussion)** *Geology*: Vol. 29, No. 5, pp. 468-469.
 38. WILSON NSF & ZENTILLI M (1999) **The Role of organic matter in the genesis of the El Soldado volcanic-hosted manto-type Cu deposit, Chile.** *Economic Geology*, 94, 1115-1136.
 39. GRIST, A. M., AND ZENTILLI, M. (2000) **Apatite fission track constraints on a widespread Early Cretaceous heating episode in the Canadian Atlantic margin: added effect of a climatically perturbed gradient?** FT2000, 9th International Conference on Fission Track Dating and Thermochronology, Lorne, Australia, Feb. 6-11, *Geological Society of Australia Abstract Series #58*, 135-137.
 40. GLASMACHER, U., ZENTILLI, M. & GRIST, A.M. (1998) **Apatite fission track thermochronology of Paleozoic sandstones and the Hill-intrusion, Northern Linksrheinisches Schiefergebirge, Germany.** In P. Van den haute and F. de Corte (Eds.), *Advances in Fission-Track Geochronology*, *Kluwer Academic Publishers*, Dordrecht, The Netherlands, ISBN 0-7923-4904-0, 151-172.
 41. CARRILLO-CHAVEZ, A., H.HUYCK, & M.ZENTILLI (1999) **Age constraints on host rocks of Los Uvares gold deposit: magmatic pulses in southernmost Baja California, Mexico.** *Geofísica Internacional*, 38, 27-33.
 42. ARNE, D.C., ZENTILLI, M., A.M.GRIST, & M.COLLINS (1998) **Constraints on the timing of thrusting during the Eurekan Orogeny, Canadian Arctic Archipelago: an integrated approach to thermal history analysis.** *Can. Journal of Earth Sciences*, 35, 30-38.
 43. REYNOLDS, P.H., RAVENHURST, C., ZENTILLI M. & LINDSAY, D. (1998) **High-precision $^{40}\text{Ar}/^{39}\text{Ar}$ dating of two consecutive hydrothermal events in the Chuquicamata porphyry copper system, Chile.** *Chemical Geology, Isotope Geoscience*, 148, 45-60
 44. ZENTILLI, M., F.MUNIZAGA, M.C.GRAVES, R.BORIC, N.WILSON, P.MUKHOPADHYAY, L.SNOWDON (1997) **Hydrocarbon Involvement in the Genesis of Ore Deposits: an Example in Cretaceous Stratabound (Manto-Type) Copper Deposits of Chile.** *International Geology Review*. 39, 1-21.
 45. ZENTILLI, M. AND FOX, D. (1997) **Geology and mineralogy of the Meguma Group and their importance to environmental problems in Nova Scotia (Foreword)**, *Atlantic Geology*, 33, 81-85.
 46. CAMERON, B., & ZENTILLI, M. (1997) **Interaction between the mineralized transition of the Goldenville-Halifax Formations and granitoids of the Liscomb Complex, NS: Evidence from mineral and whole rock chemistry.** *Atlantic Geology*, 33, 143-156.
 47. PASAVA, J., DELIAN, F. & ZENTILLI, M. (1997) **Involvement of sulfur from black shales in the formation of tin deposits of the Dachang tin field: Evidence from sulfur isotope study.** *Mineral Deposits, Papunen (ed.)* © 1997 *Balkema, Rotterdam*, ISBN 90 5410 889 4, 91-91.
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NOTE:

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Halifax, October 14, 2018



Marcos Zentilli and guide Reynaldo Sandoval in Rio Baker, Aisén, Chilean Patagonia, in 1963.



Marcos Zentilli in Herbert Ø, Greenland



Perennial Springs at 6°C in Colour Peak Diapir (background hill), Expedition Fiord, Axel Heiberg Island, Nunavut, where permafrost is 600 m thick.



Paleohydrothermal carbonate-sulphide vein array and gossan by White Glacier, Axel Heiberg Island, Nunavut