

Thomas Darwin Bullen

Research Hydrologist

Water Resources Discipline, U.S. Geological Survey, Mail Stop 420, 345 Middlefield Rd., Menlo Park, CA 94501; Phone: 650-329-4577; Fax: 650-329-4542; tdbullen@usgs.gov

Education

Dartmouth College, B.A., 1972 Engineering, Geology

Dartmouth College, M.A., 1978 Geology. Thesis: Structure and stratigraphy of the eastern Cardigan Quadrangle, central New Hampshire

University of California, Santa Cruz, Ph.D., 1986 Geology. Dissertation: Magmagenesis in the Devils Garden lava field: Implications for the nature of the sub-continental lithosphere at an active continental margin

Professional Societies

American Geophysical Union, Geological Society of America, Mineralogical Society of America, International Association of Geochemistry

Professional Experience

March, 2008-present: *Chercheur Invité*, Le Studium/BRGM/Orléans, France. Primary objectives are to develop a technique to determine the oxygen isotope composition of chromate in order to determine sources of chromium contamination in groundwater, and to develop metal stable isotope multi-tracer approaches.

March, 1990-present: *Research Hydrologist*, National Research Program, Water Resources Discipline, U.S. Geological Survey. My primary research centers on the use of metal and metalloid isotopes (e.g., Cr, Fe, Ca, B and Te stable isotopes and Sr radiogenic isotopes) and water chemistry to understand hydrologic and biogeochemical processes at scales ranging from mineral-water interfaces to water flowpaths in watersheds and regional aquifers.

March, 1989-October, 1989: *Contractual appointment* with Lasertec, Inc. of San Jose, CA, to develop petrologic applications of scanning confocal laser microscope system.

January, 1987-March, 1990: *Faculty appointment* to Branch of Igneous and Geothermal Processes, USGS/ Menlo Park, to conduct isotopic investigation of igneous rocks from the Lassen region of the southernmost Cascade Range (Sr, Pb, Nd, O isotopes, rare-earth element concentrations).

September, 1985-June, 1989: *Lecturer*, Department of Geological Sciences, California State University, Hayward.

September, 1980-June, 1985: *Research and teaching assistant*, University of California, Santa Cruz.

November, 1977-July, 1980: *Research assistant*, Petrology Group, Woods Hole Oceanographic Institution, Woods Hole, MA.

Examples of Publications

- Bullen, T.D., Krabbenhoft, D. & Kendall C., 1996, Kinetic and mineralogic controls on the evolution of groundwater chemistry and $^{87}\text{Sr}/^{86}\text{Sr}$ in a sandy silicate aquifer, northern Wisconsin. *Geochim. et Cosmochim. Acta*, v.60, n.10, pp.1807-1821.
- Bullen, T.D., White, A.F., Blum, A.E., Harden, J. & Schulz, M., 1997, Chemical weathering of a soil chronosequence on granitoid alluvium: II. mineralogic and isotopic constraints on the behavior of Sr. *Geochim. et Cosmochim. Acta*, v.61, n.2, pp.291-306.
- Bullen, T.D. & Kendall C., 1998, Tracing of weathering reactions and water flowpaths: a multi-isotope approach; *In* Kendall, C. and McDonnell, J.J., eds., *Isotope Tracers in Catchment Hydrology*, Elsevier Science B.V. pp. 611-646.
- Johnson, T.M., Herbel, M.J., Bullen, T.D. & Zawislanski, P.T., 1999, Selenium isotope ratios as indicators of selenium sources and oxyanion reduction. *Geochim. Cosmochim. Acta*, v. 63, n. 18, p. 2775-2783.
- Bullen, T.D., White, A.F., Childs, C.W., Vivit, D.V. & Schulz, M.S., 2001, Demonstration of significant abiotic iron isotope fractionation in nature. *Geology*, v.29, n.8, pp. 699-702.
- Bullen, T.D., Fitzpatrick, J.A., White, A.F., Schulz, M.S. & Vivit, D.V., 2004, Calcium stable isotope evidence for three soil calcium pools at a granitoid chrono-sequence; *In* Wanty, R.B., and Seal, R.R., II, eds., *Water-Rock Interaction*, Proceedings of the 11th International Symposium on Water-Rock Interaction, Saratoga Springs, New York, July 2004. Taylor & Francis, London, v. 1, p. 813-817.
- Bullen, T.D. & Bailey, S.W., 2005, Identifying calcium sources at an acid deposition-impacted spruce forest: a strontium isotope, alkaline earth element multi-tracer approach. *Biogeochemistry*, v.74, n.1, pp. 63-99.
- Skulan, J., Bullen, T.D., Anbar, A.D., Puzas, J.E., Shackelford, L., LeBlanc, A. & Smith S.S., 2007, Natural calcium isotopic composition of urine as a marker of bone mineral balance. *Clinical Chemistry*, v. 53, n. 6, pp. 1155-1158.
- Bullen, T.D., 2007, Chromium stable isotopes as a new tool for forensic hydrology at sites contaminated with anthropogenic chromium; *In* Bullen, T.D. and Wang, Y., eds., *Water-Rock Interaction*, Proceedings of the 12th International Symposium on Water-Rock Interaction, Kunming, China, 31 July - 5 August, 2007. Taylor & Francis, London, v. 1, pp. 699-702.
- Fantle, M.S., and Bullen, T.D., 2009, Essentials of iron, chromium, and calcium isotope analysis of natural materials by thermal ionization mass spectrometry: *Chemical Geology*, v. 258, no. 1-2, p. 50-64.
- Bullen, T.D. & Walczyk, T.R., 2009, Environmental and biomedical applications of metal stable isotopes. *Elements*, v.5, pp. 381-385 (T.D. Bullen and A. Eisenhauer, eds).
- Bullen, T.D., 2011, Stable isotopes of transition and post-transition metals as tracers in environmental studies. *In* Handbook of Environmental Isotope Geochemistry, Advances in Isotope Geochemistry (M. Baskaran, ed.), Springer-Verlag. Pp. 177-203.

Recent Publications with Graduate Students

- Ellis, A.S., Johnson, T.M. & Bullen, T.D., 2002, Chromium isotopes and the fate of hexavalent chromium in the environment. *Science*, v.295, pp. 2060-2062.

- Balci, N., Bullen, T.D., Witte-Lien, K., Shanks, W.C., Motelica, M. & Mandernack, K. W., 2006, Iron isotope fractionation during microbially stimulated Fe(II) oxidation and Fe(III) precipitation. *Geochim. Cosmochim. Acta*, v. 70, pp. 622-639.
- Baesman, S.M., Bullen, T.D., Dewald, J., Zhang, D.H., Curran, S., Islam, F.S., Beveridge, T.J., & Oremland, R.S., 2007, Formation of tellurium nanocrystals during anaerobic growth of bacteria using Te-oxyanions as respiratory electron acceptors. *Applied and Environmental Microbiology*, v. 73, pp. 2,135-2,143.
- Page, B.D., Bullen, T.D., and Mitchell, M.J., 2008, Influences of calcium availability and tree species on Ca isotope fractionation in soil and vegetation: *Biogeochemistry*, v. 88, no. 1, p. 1-13.
- Griffith, E.M., Paytan, A., Caldeira, K., Bullen, T.D., Thomas, E. 2008 A dynamic marine calcium cycle during the past 28 million years: *Science*, v. 322, no. 5908, p. 1671-1674.
- Smith, J.P., Bullen, T.D., Brabander, D.J., and Olsen, C.R., 2009, Strontium isotope record of seasonal scale variations in sediment sources and accumulation in low-energy, subtidal areas of the lower Hudson River estuary: *Chemical Geology*, v. 264, no. 1-4, p. 375-384.

Synergistic Activities

- Conference Organizer, Applied Isotope Geochemistry IV, Monterey, CA, June, 2001.
- Member, Scientific Organizing Committee, Applied Isotope Geochemistry V-IX.
- Chair, Water Quality Technical Committee, Hydrology Section, AGU, 2002-2004, 2010-present.
- Program Representative for Hydrology Section, Joint Assembly, AGU, 2003-2008.
- Working Group on Isotope Tracers of Groundwater Sustainability, IAEA, October 2001
- Instructor for Isotope Hydrology Short Course, GSA Annual Meetings, 1997, 1999, 2001.
- Member, Workshop to develop NSF Program on biogeosciences research, 2001.
- Member, Workshop to develop NSF Program on Critical Zone research (CZEN), 2005
- Member, Workshop on development of isotope standards, NIST, May, 2007.
- Editorial Board, *Geochemical Transactions*, 2005-present.
- Editor, *Water-Rock Interaction*, Proceedings of the 12th International Symposium on Water-Rock Interaction, Kunming, China, 31 July - 5 August, 2007. Taylor & Francis, London, 2 volumes, 1705p.
- Secretary, International Association of Geochemistry (IAGC), 2008-present.

External Collaborators (last 48 months)

Jugdeep Aggarwal (UC Santa Cruz), Ariel Anbar (Arizona State University), Scott Bailey (USFS), Daniel Brabander (Wellesley College), Susan Brantley (Penn State University), Oliver Chadwick (UC Santa Barbara), Cyril Childs (Victoria University, Wellington, New Zealand), Andre Ellis (University of Texas/El Paso), Matthew Fantle (UC Berkeley), Jean-Pierre Girard (BRGM, Orleans, France), Jakub Hruska (Czech Geological Survey, Czech Republic), Thomas Johnson (University of Illinois/Urbana-Champaign), Sang-Tae Kim (McGill University, Canada), Pavel Kram (Czech Geological Survey, Czech Republic), Kevin Mandernack (Colorado School of Mines), Romain Millot (BRGM, Orleans, France), Myron Mitchell (SUNY Syracuse), Philippe Negrel (BRGM, Orleans, France), Adina Paytan (Stanford University), Steven Perakis (USGS/BRD), Joseph Skulan (University of Wisconsin/Madison), Avner Vengosh (Ben Gurion University, Israel and Duke University).

Thesis Advisors

Kenneth Cameron (Ph.D. at UC Santa Cruz)

John Lyons (M.A. at Dartmouth College)

Graduate Students Advised/Assisted

Gabriel Bacca (University of New Hampshire), Andre Ellis (University of Illinois/Urbana-Champaign), Elizabeth Griffith (Stanford University), Claire Hoff (University of New Hampshire), Filip Oulehle (Charles University, Prague, Czech Republic), Blair Page (SUNY Syracuse), Stephen Porder (Stanford University), Joseph Smith (University of Massachusetts/Boston), Nurgul Balci (Colorado School of Mines), Shaun Baesman (San Francisco State University), Margaret Zimmer (Oberlin College)

Post-doctoral Scientists Advised

Daniel Bain (currently at University of Pittsburg)