

# ALBERT S. COLMAN

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## PROFESSIONAL PREPARATION

1994	AB	Harvard College	Earth & Planetary Sciences
2002	PhD	Yale University	Dept. Geology & Geophysics
2002-2004	Postdoc	Carnegie Inst. Washington	Geophysical Laboratory
2004-2007	Postdoc	U. Maryland Biotech. Inst.	Center of Marine Biotech.

## APPOINTMENTS

2008 - pres.	Assistant Professor	U. Chicago	Dept. Geophysical Sciences
2008 - pres.	Visiting Scientist	U. Maryland Biotech. Inst.	Center of Marine Biotech.
2004 - 2007	Research Associate	U. Maryland Biotech. Inst.	Center of Marine Biotech.
2002 - 2004	Postdoctoral Fellow	Carnegie Inst. Washington	Geophysical Laboratory
1996 - 2002	PhD Student; TF	Yale University	Dept. Geology & Geophysics
1996	Research Assistant	U. Hawai'i	Dept. Oceanography
1994-1995	Research Assistant	Harvard University	Div. Applied Sciences

## HONORS AND AWARDS

9/07	Distinguished Service Award, U. Maryland Biotechnology Inst.
3/02-8/04	Carnegie Postdoctoral Fellowship, Geophysical Lab, Carnegie Inst. Washington.
5/02	William Ebenezer Ford Prize in mineralogy, Yale University.
5/01	Orville Award for Outstanding Doctoral Research, Yale University.
9/00	G. Evelyn Hutchinson Graduate Fellow, Yale Institute for Biospheric Studies.
5/99	Estwing Hammer Award, Yale University.
9/96-8/99	NSF Graduate Research Fellowship, Yale University.
9/96	Bateman Award, Yale University.
6/94	Highest Honors on senior thesis, Harvard Earth and Planetary Sciences.
6/94	Graduated <i>magna cum laude</i> , Harvard College.
9/90-6/94	Harvard College National Scholar.

## FIELD WORK

### Research Cruises:

GEOTRACES Intercalibration Cruise, <i>R/V Knorr</i> Cruise 193-6-2 BATS site; transect to Norfolk, VA.	6/08-7/08
CREST-1, <i>R/V John Dempsey</i> , (Chief Scientist) Connecticut River Estuary, Long Island Sound.	9/02
NATO 2001 Black Sea Expedition, <i>R/V Knorr</i> Cruise 162-17-2. Black Sea.	6/01

BATS 146, <i>R/V Weatherbird II</i> .	11/00
BATS site, North Atlantic Subtropical Gyre.	
HOT Cruises 70, 71, 72, 73, and 113, <i>R/V Moana Wave &amp; R/V Ka'Imikai-O-Kanaloa</i> .	3/96-6/96, 3/00
Station ALOHA, North Pacific Subtropical Gyre	
ALOHA-CLIMAX 1 Transect, <i>R/V Moana Wave</i> .	7/96
North Pacific Subtropical Gyre	
SANTA CLAUUS, <i>R/V Polar Duke</i> Cruise 94-12.	12/94
Antarctic Peninsula, Drake Passage	

*Terrestrial & Cryospheric Field Work:*

Kamchatka Microbial Observatory, Uzon Caldera, Russia.	8/05-9/05, 8/07
Connecticut River and Long Island Sound time-series.	2001-2002
Summit, Greenland (GISP2 site). Atmospheric chemistry.	6/94-7/94, 7/95-8/95
Northern Manitoba, Canada. BOREAS. Atmospheric chemistry.	2/95
Harvard Forest (LTER site). Atmospheric chemistry.	1990-1993

**REVIEWER AND COMMITTEES**

Journals & Refereed Books:

*Geochimica et Cosmochimica Acta, Chemical Geology, Limnology & Oceanography, Marine Geology, Environmental Science & Technology, Estuarine Coastal & Shelf Science, SEPM Special Publications, Scientists on GAIA 2, Encyclopedia of Ocean Sciences, Biogeochemistry of Dissolved Organic Carbon*

Funding Agencies:

*NSF, National Environment Research Council (UK), Petroleum Research Fund of the Am. Chem. Soc., Council for Earth and Life Sciences (ALW of the NWO, The Netherlands), NASA*

Panels:

*NASA Mars Fundamental Research Program*

Committees:

*NASA Mars Sample Return Science Steering Group II, NASA Microbial Systems Exploration Initiative, Mars Science Lab Mission – Sample Analysis at Mars Calibration Peer Review*

**PROFESSIONAL AFFILIATIONS**

American Society for Limnology and Oceanography  
 American Society for Microbiology  
 American Geophysical Union (Biogeosciences Section)  
 Geochemical Society  
 Geological Society of America (Geobiology & Geomicrobiology Division)

## **PUBLIC OUTREACH ACTIVITIES**

### **San Francisco Exploratorium**

2003-present

*San Francisco, CA*

- i) Served as scientific lead on development of extremophile research multimedia web exhibit (<http://www.exploratorium.edu/kamchatka/index.html>) which was featured in *Science* (9/29/06) and is the recipient (5/07) of a national award from the American Association of Museums.
- ii) Introduced stable isotope analyses of plant carbon and nitrogen as a tool for tracing the influence of anthropogenic CO<sub>2</sub> and regional nitrogen deposition in the S.F. Bay Area through public outreach division.

### **Futurefarmers (New Media Studio)**

2002-present

*San Francisco, CA*

Scientific advisor to various artistic collaborations with M. Swaine and A. Franceschini that involve perception, art, science, and technology.

### **Maryland Public Schools**

2005-present

*Greater Baltimore Metropolitan Area*

Gave interactive lectures and tours to middle school and high school science students to emphasize the excitement of scientific exploration and the differences between textbook science and the process of discovery in modern geomicrobiology research.

### **Maryland Science Center**

2004

*Baltimore, MD*

“Science Person of the Month” for 11/04 in TerraLink Center for Earth System Science. Met with visitors and explained how field observations in environmental and Earth Science help us learn about modern and past changes in climate and Earth’s atmospheric composition.

## PUBLICATIONS

- Mohamed, NM, AS Colman, Y Tal, RT Hill (2008). Diversity and expression of nitrogen fixation genes in bacterial symbionts of marine sponges. *Envir. Microbiology*, in press.
- Colman, AS, SM Techtmann, FT Robb (2008). Carbon monoxide and the chemolithoautotrophic potential of Early Earth and Mars. For submission to *Geophysical Research Letters*, in preparation.
- Terwilliger, V.J., Z. Eshetu, A.S. Colman, T. Bekele, A. Gezahgne, and M.L. Fogel (2008) Reconstructing palaeoclimate and land use from  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  values of soil organic matter: a test using arid and wetter elevation transects in Ethiopia. In review, *Geoderma*.
- Colman, A.S., R.E. Blake, D.M. Karl, R.W. Wildman, B.P. Colman, and M.L. Fogel (2008) Method for measuring the oxygen isotope composition of phosphate in seawater, fresh water, and waste water treatment plant effluent. For submission to *Analytical Chemistry*, in preparation.
- Wiedemann-Bidlack, F.B., A.S. Colman, and M.L. Fogel (2008). Stable isotope analyses of phosphate oxygen from biological apatite: a new technique for microsampling, microprecipitation of  $\text{Ag}_3\text{PO}_4$ , and removal of organic contamination. *Rapid Commun. Mass Spectrom.*, 22, 1807-1816.
- Reid, I.N., W.B. Sparks, S. Lubow, M. McGrath, M. Livio, J. Valenti, K.R. Sowers, H.D. Shukla, S. MacAuley, T. Miller, R. Suvanasuthi, R. Belas, A. Colman, F.T. Robb, P. DasSarma, J.A. Müller, J.A. Coker, R. Cavicchioli, F. Chen & S. DasSarma. (2006) Terrestrial models for extraterrestrial life: methanogens and halophiles at Martian temperatures, *Int. Jour. Astrobiology*, 5, 10.1017/S1473550406002916.
- Colman, A.S., R.E. Blake, D.M. Karl, M.L. Fogel, and K.K. Turekian (2005). Marine biogeochemistry as revealed through the oxygen isotope composition of phosphate. *Proc. Nat. Acad. Sci.*, 102, 13023–13028.
- Colman, A.S. (2002). The oxygen isotope composition of dissolved inorganic phosphate and the marine phosphorus cycle. PhD Dissertation, Yale University.
- Vennemann, T.W., H.C. Fricke, R.E. Blake, J.R. O'Neil, and A. Colman (2002). Oxygen isotope analysis of phosphates: a comparison of techniques for analysis of  $\text{Ag}_3\text{PO}_4$ . *Chem. Geol.*, 185, 321-336.
- Colman, A.S. and H.D. Holland (2000). The global diagenetic flux of phosphorus from marine sediments to the oceans: redox sensitivity and the control of atmospheric oxygen levels. in *Marine Authigenesis: from Global to Microbial*, Eds. C.R. Glenn, J. Lucas, and L. Prévôt-Lucas. *SEPM Spec. Pub. No. 66*, pp. 53-75.
- Munger, J.W., D.J. Jacob, S.-M. Fan, A.S. Colman, J.E. Dibb (1999). Concentrations and snow-atmosphere fluxes of reactive nitrogen at Summit, Greenland. *J. Geophysical Research*, 104, 13721-13734.
- Munger, J.W., S.-M. Fan, P.S. Bakwin, M.L. Goulden, A.H. Goldstein, A.S. Colman, and S.C. Wofsy (1998). Regional budgets for nitrogen oxides from continental sources: variations of rates for oxidation and deposition with season and distance from source regions. *J. Geophysical Research*, 103, 8355-8368.
- Colman, A.S., F.T. Mackenzie, and H.D. Holland; reply by P. Van Cappellen and E.D. Ingall (1997). Redox stabilization of the atmosphere and oceans and marine productivity. *Science*, 275, 406-408.
- Munger, J.W., S.-M. Fan, A.S. Colman, I.R. Mendelson, and D.J. Jacob (1995). Eddy correlation measurements of snow-atmosphere exchange of  $\text{NO}_y$  and  $\text{H}_2\text{O}$  at Summit, Greenland. *Arctic Research of the U.S.*

## **PRESENTATIONS**

### **Invited talks**

- Astrobiology Science Conference, Santa Clara, CA, April 2008.
- Gordon Research Conference, Chemical Oceanography, August 2007.
- University of Florida, Dept. Geological Sciences, Dept. Seminar, October 2006.
- University of Chicago, Dept. Geophysical Sciences, Dept. Seminar, April 2006.
- Portland State University/Oregon State University, IGERT Program Seminar, March 2006.
- Florida State University, Dept. Geological Sciences, Colloquium, October 2004.
- Smithsonian National Museum of Natural History, Dept. Min. Sci. July 2004.
- The Johns Hopkins University, Dept. of Earth & Planetary Sciences. Departmental Seminar. March 2004.
- University of Maryland, Dept. of Geology. Departmental Seminar. March 2004.
- Carnegie Institution of Washington, Geophysical Laboratory. Departmental Seminar. February 2004.
- San Francisco Exploratorium, Seminar. December 2003.
- Old Dominion University, Earth & Atmospheric Sciences. Departmental Seminar. October 2003.
- DISCO XVIII (Dissertations in Chemical Oceanography), sponsored by NSF, ONR, NOAA. Waikoloa, Hawai'i. September 2003.
- American Society for Limnology and Oceanography, Annual Mtg, Salt Lake City, UT. Special session on Geologic Record of Phosphorus Cycling. February 2003.
- University of Missouri, Department of Geological Sciences. Colloquium. April 2002.
- Carnegie Institution of Washington, Geophysical Laboratory. Departmental Seminar. February 2002.
- Universität Erlangen, Institut für Geologie und Mineralogie. Departmental Seminar. July 2000.
- Harvard University, Dept. of Earth and Planetary Sciences. Retirement Symposium in honor of Professor Heinrich D. Holland, May 2000.

### **National meetings**

- SM Techtmann, TJ Lin, AS Colman, FT Robb (June 2008). Distinct regulation of carbon monoxide pathways to carbon fixation and energy conservation in anaerobic bacteria from Kamchatkan hot springs. *Amer. Soc. Microb.* 108<sup>th</sup> Gen. Mtg., Abstr. no. I-003 (Boston, MA).
- AS Colman (April 2008). The marine phosphorus cycle in the Archean and Paleoproterozoic. 5<sup>th</sup> Astrobiology Science Conference, Abstr. no. 15-04-O (Santa Clara, CA).
- AS Colman, SM Techtmann, and FT Robb (October 2007). Carboxydrotrophy, metabolic mutualism, and carbon monoxide fluxes in the Archean atmosphere. *Geol. Soc. Amer. Ann. Mtg.*, Abstr. no. 147-1 (Denver, CO).
- PA Schroeder, E Bonch-Osmolovskaya, A Colman, DE Crowe, G Karpov, J Kyle, F Robb, C Romanek, J Wiegel, C Zhang (October 2007). Microbially dominated terrestrial hot spring mineral assemblages in Kamchatka, Russia: the present is the key to the past. *Geol. Soc. Amer. Ann. Mtg.*, Abstr. no. 11-14, (Denver, CO).
- DT Newby, JA Lacey, HG Silverman, JM Barnes, AS Colman, SM Techtmann, DL Maeder, A Lebedinski, LJ Meincke, P Richardson, T Sokolova, E Osmolovskaya and FT Robb (September 2007). Postgenomic analysis of extremely thermophilic, hydrogenogenic carboxydrotrophs. *Thermophiles 2007* (Bergen, Norway).

- PA Schroeder, E Bonch-Osmolovskaya, E Burgess, A Colman, D Crowe, J Fiser, M Hodges, E Hollingsworth, G Karpov, I Kublanov, J Kyle, G Mills, A Neal, N Pimenov, F Robb, C Romanek, T Slepova, T Sokolova, E Spencer, S Techtmann, I Wagner, J Wiegel, N Wittman, C Zhang, W Zhao (June 2007). Nitrogen and Smectites from Terrestrial Hot Springs in the Uzon Caldera, Kamchatka, Far-Eastern Russia. *Ann. Mtg. Clay Minerals Soc.* (Santa Fe, NM).
- A Colman, S Techtmann, E Burgess, T Sokolova, T Slepova, E Bonch-Osmolovskaya, N Pimenov, C Romanek, D Crowe, P Schroeder, J Goin, S Cady, V Samarkin, SB Joye, C Zhang, J Eisen, F Robb, J Wiegel. (March 2007). Geochemical, Microbiological and Metagenomic Assessment of Carboxydrotrophic and Sulfate Reducing Microbes in Uzon Caldera, Kamchatka, Russia. NSF MO/MIP PI's Meeting (Washington, DC).
- DT Newby, S Techtmann, JM Barnes, HG Silverman, JA Lacey, KL Epting, AS Colman, DL Maeder, FT Robb (November 2006) Regulation of Carbon Monoxide Dehydrogenase Gene Complexes by Coxa in *Carboxydotherrmus hydrogenoformans*. Annual Mtg, Amer. Inst. Chem. Engineers (San Francisco, CA).
- S Techtmann, A Colman, D Newby, J Barnes, D Maeder, F Robb. (September 2006). Regulation of hydrogen production by a thermophile oxidizing carbon monoxide to CO<sub>2</sub> anaerobically. *Extremophiles 2006* (Brest, France).
- FT Robb, S Techtmann, AS Colman, DT Newby, J Barnes, DL Maeder. (August 2006). Metabolic roles of carbon monoxide utilizing thermophiles in geothermal microbial communities. 11<sup>th</sup> ISME (Vienna, Austria).
- Techtmann, S, A Colman, DL Maeder, K Epting, J Lacey, H Silverman, DT Newby, and FT Robb (August 2006). Life in hot carbon monoxide, with hydrogen production. Annual Meeting, Society for Industrial Microbiology (Baltimore, MD).
- Newby, DT, J Lacey, K Epting, H Silverman, JM Barnes, AS Colman, S Techtmann, DL Maeder and FT Robb (May 2006). Growth condition dependent differential gene expression in the carbon monoxide oxidizing thermophile, *Carboxydotherrmus hydrogenoformans*. 106th Annual Meeting, American Society for Microbiology (Orlando, FL).
- Epting, KL, DW Reed, JM Barnes, KD Schaller, JA Lacey, HG Silverman, CJ Perman, AS Colman, DL Maeder, FT Robb, DT Newby, VS Thompson (May 2006). Proteomic and genomic investigation of the hydrogen producing thermophile *Carboxydotherrmus hydrogenoformans*. 54th Annual Meeting, American Society for Mass Spectrometry (Seattle, WA).
- Blake, RE, Y Liang, AS Colman, D Dogru (May 2006). Distinguishing Biotic from Abiotic Phosphate Oxygen Isotopic Signatures. AGU Spring Meeting (Baltimore, MD).
- Colman, AS, SM Techtmann and FT Robb (March 2006). Carboxydrotrophy, Metabolic Mutualism, and Consortial Thermodynamics. The Astrobiology Science Conference 2006 (Washington, DC).
- Colman, AS, RE Blake, Y Liang, DM Karl, KK Turekian, ML Fogel (February 2006) Phosphate oxygen isotopes and microbial phosphorus cycling in the oceans. *Eos Trans. AGU*, 87, Ocean Sci. Meet. Suppl., Abstract OS34D-03 (Honolulu, HI).
- Colman, AS, and HD Holland (2005). How continental margin sediments control the weathering flux of phosphate to the oceans. *Geol. Soc. Amer. Annual Mtg.*, Abstr. no. 177-2 (Salt Lake City, UT).
- Colman, AS & FT Robb (2005). Carboxydrotrophy – the misunderstood metabolism. *Biogeochemistry & Molecular Biology of Extremophiles 2005* (Paratunka, Kamchatka, Russia).
- Colman, A.S., S. Techtmann, S. Shukla, N. Krupatkina, G.M. King, A. Neal, D.E. Crowe, C.S. Romanek, J.Wiegel, and F.T. Robb (2005). Carbon monoxide and the bugs who love it. To be presented at the 229<sup>th</sup> National Mtg. of the American Chemical Society (San Diego, CA).
- Reid, I.N., K.R. Sowers, H.D. Shukla, S. MacAuley, T. Miller, R. Suvanasuthi, R. Belas, A. Colman, F.T.; Robb, P. DasSarba, J.A. Muller, F. Chen, R. Cavicchioli, S. DasSarma, W.B. Sparks, S. Lubow, M. McGrath, M. Livio, J. Valenti (2005). Terrestrial analogues for extraterrestrial life. *NASA Astrobiology Institute 2005* (Boulder, CO).
- Eshetu, Z. V.J. Terwilliger, A.S. Colman, and M.L. Fogel (2005). Insights into patterns of past vegetation and human settlement in Ethiopia from stable isotopic analyses of soil organic matter. *Applied Isotope Geochemistry VI* (Prague, Czechoslovakia.)

- Terwilliger, V.J., Z. Eshetu, A.S. Colman, and M.L. Fogel (2004).  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  values of soil organic matter over drought and non-drought affected elevation gradients in Ethiopia: calibrating for environmental reconstruction. *Eos Trans. AGU, Fall Mtg. Suppl.* PP42A-06.
- Colman, A.S. (2004). The role of margin sediments in mediating the weathering flux of phosphate to the oceans. Coastal Benthic Exchange Dynamics Meeting. USGS, Ft. Petersburg, FL.
- Colman, A.S., A. Wessels, M.E. Swaine, and M.L. Fogel (2003). Tracking urban air deterioration in San Francisco: carbon and nitrogen isotope study of weedy plants. *EOS Trans. AGU, Fall Mtg. Suppl.*, B31D-0329.
- Wiedemann-Bidlack, F.B., A.S. Colman, and M.L. Fogel (2003). Stable isotope analyses of phosphate oxygen from micro-samples of biological apatite: a new routine procedure for silver phosphate microprecipitation and the removal of organic contamination. *EOS Trans. AGU, Fall Mtg. Suppl.*, B31D-0340.
- Colman, A.S. (2003). Temporal variability in the marine phosphorus cycle. *Amer. Soc. Limnol. Oceanogr. Annual Mtg.*, SS2.05.
- Colman, A.S., R.E. Blake, A.M. Martini, and M.L. Fogel (2002).  $\delta^{18}\text{O}$  of  $\text{PO}_4$  as a hydrogeologic tracer for nutrient contamination and subsurface microbial activity. *Geol. Soc. Amer. Annual Mtg.*, 69-12.
- Colman, A.S., D.M. Karl, M.L. Fogel, and R.E. Blake (2002). The oxygen isotope composition of phosphate in the Pacific and Atlantic Oceans. *EOS Trans. AGU, Oc. Sci. Mtg. Suppl.*, OS22P-11.
- Colman, A.S., D.M. Karl, M.L. Fogel, and R.E. Blake (2000). A new technique for the measurement of phosphate oxygen isotopes of dissolved inorganic  $\text{PO}_4$  in natural waters. *EOS Trans. AGU, Fall Mtg. Suppl.*, B51A-09.
- Colman, A.S., H.C. Fricke, R.E. Blake, D. Rumble III, and M.L. Fogel (2000). Oxygen isotope analysis of micromole quantities of phosphate. *EOS Trans. AGU, Spring Mtg Suppl.*, B32A-04.
- Colman, A.S. and H.D. Holland (1999). The dominance of the riverine particulate phosphorus flux in supplying phosphate to the oceans, and a 10,000 year residence time for phosphorus. 9<sup>th</sup> Annual Goldschmidt Conference.
- Colman, A.S. and H.D. Holland (1998). The redox sensitivity of benthic phosphate fluxes and the control of atmospheric oxygen levels. *EOS, Transactions of the AGU*, 79, No. 17, S186.
- Karl, D., G. Tien, K. Bjorkman, K. Yanagi, R. Letelier, A. Colman, and A. Thomson (1996). The "forgotten" open ocean P-cycle. Hawaii Ocean Time-series HOT-75 Commemorative Science Symposium, Honolulu.
- Munger, J.W., A.S. Colman, M.S. Foreman-Fowler, D.J. Jacob, J.D. Dibb, and V. Hart (1995). Reactive nitrogen oxides at Summit, Greenland. *EOS, Transactions of the AGU*, 76, No. 46, F100.
- Colman, A.S. and H.D. Holland (1994). The global diffusive flux of phosphorus from marine sediments into the oceans. *EOS, Transactions of the AGU*, 75, No. 3, 96.