

## James W. C. White

Professor of Geological Sciences, and of Environmental Studies

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### Education:

Florida State University, Tallahassee, Florida

B.S. 1975 Chemistry

Columbia University, New York, New York

M.A. 1977 Geological Sciences

M.Phil. 1978 Geological Sciences

Ph.D. 1983 Geological Sciences

Thesis: The Climatic Significance of D/H Ratios in White Pine in the Northeastern United States

### Awards:

Florida State University:

- American Chemical Society Undergraduate Award in Analytical Chemistry, 1974-1975

Columbia University:

- George P. Pegram Distinguished Fellow, 1978-1979
- Bruce C. Heezen Memorial Fellowship, 1979

University of Colorado:

- Outstanding Geoscience Faculty, Department of Geological Sciences 2004
- Highly Cited Researchers, 2004, 2015
- Sustainability Award, Green Faculty, University of Colorado, 2008
- Distinguished Teacher Award, Environmental Studies Program, 2011
- Elected Fellow, American Association for the Advancement of Science, 2014
- National Associate of the National Academy of Sciences, 2016
- Robert L. Sterns Medal, 2016

### Employment:

Associate Research Scientist - Lamont - Doherty Geological Observatory of Columbia University, 1983 to 1987

Visiting Research Scientist - Centre d'Etudes Nuclaire, Saclay France (on leave from Columbia University), 1985 to 1986, 1987

Assistant Professor, Department of Geological Sciences, University of Colorado, Boulder, 1988 to 1994

Associate Fellow, Institute of Arctic and Alpine Research, 1988 to 1994

Associate Professor, Department of Geological Sciences, University of Colorado, Boulder, 1994 to 2002

Professor, Department of Geological Sciences, and Environmental Studies Program, University of Colorado, Boulder, 2002 to present

Fellow, Institute of Arctic and Alpine Research, 1994 to present

Director, Environmental Studies Program, University of Colorado, 1994 to 2005, Interim Director, Spring 2006

Interim Director, Institute of Arctic and Alpine Research, University of Colorado, 2007

Director, Institute of Arctic and Alpine Research, University of Colorado, 2008 to present

Director, Sustainability Energy and Environment Complex, 2015 to present

**Refereed Publications** (as of 1/17, citation count is >14,500, H index of 58, using Web of Science data; using Google Scholar, citation count is >21,900, H index of 68)

1. White, J. W. C., and J. R. Lawrence, The relationships between the non-exchangeable hydrogens of tree ring cellulose and source waters for tree sap, in Proceedings of the International Meeting on Stable Isotopes in Tree Ring Research, ed. by G. C. Jacoby, U. S. Department of Energy, November, 1980.
2. Stuiver, M., Rebello, A., White, J., and Broecker, W., Isotopic indicators of age/growth in tropical trees, in Age and Growth of Tropical Trees: New

- Directions for Research, ed. by F. Bormann and G. Berlyn, Yale University School of Forestry and Environmental Studies, Bulletin N. 94, pp 75-82. 1981.
3. Lawrence, J. R. Gedzelman, S. D., White, J. W. C., Smiley, D., and Lazov, P. I., Storm trajectories in eastern U. S.: D/H isotopic composition of precipitation, *Nature*, vol. 296, pp 638-640. 1982.
  4. White, J. W. C., and Gedzelman, S. D., The isotopic composition of atmospheric water vapor at Palisades New York and the concurrent meteorological conditions, *J. Geophys. Research*, vol. 89, pp 4937-4939. 1984.
  5. Lawrence, J. R., and White, J. W. C., Growing season precipitation from the D/H ratios of Eastern White Pine, *Nature*, vol. 311, pp 558-560. 1984.
  6. White, J. W. C., Cook, E. R., Lawrence, J. R., and Broecker, W. S., The D/H ratios in trees: implications for water sources and tree ring D/H ratios, *Geochim. Cosmochim. Acta*, vol. 49, pp 237-246. 1985.
  7. Takahashi, T., Olafsson, J., Broecker, W. S., Goddard, J., Chipman, D., and White, J. W. C., Seasonal study of the carbon-nutrient chemistry in the Denmark Strait area, in *Proceedings of a Nordic Symposium*, ed. by U. Stafansson, J. Marine Research Institute Reykjavik, vol. 9, pp 20-36. 1985.
  8. Stahle, D. W., E. R. Cook and J. W. C. White, Tree-ring dating of bald cypress and the potential for millenia long chronologies in the Southeast, *American Antiquity*, 50, pp 796-802. 1985
  9. Jouzel, J., G.L. Russell, R.J. Suozzo, R.D. Koster, J.W.C. White and W.S. Broecker, Simulations of the HDO and H<sub>2</sub><sup>18</sup>O Atmospheric Cycles Using the NASA GISS General Circulation Model: The Seasonal Cycle for Present Day Conditions , *J. Geophys. Research*, vol. 92(D12), pp 14739-14760. 1987.
  10. Gedzelman, S. D., J. R. Lawrence, J. W. C. White, and D. Smiley, The Isotopic Composition of Precipitation at Mohonk Lake , New York : The Amount Effect, *J. Geophys. Res.* vol 92:D1, pp 1033-1040, 1987.
  11. White, J.W.C., S.J. Johnsen, and W. Dansgaard, The Origin of Arctic Precipitation as Deduced from its Deuterium Excess, *Annals of Glaciology*, vol. 10, pp 219-220. 1988.
  12. Simpson, H. J., Hamza, M. S., White, J. W. C., Nada, A., Awad, M. A., Evaporative enrichment of deuterium and oxygen-18 in arid zone irrigation, in

- Isotope Techniques in Water Resources Development, Proceedings Series STI/PUB/757, IAEA, Vienna, pp 241-256, 1988.
13. White, J.W.C., P. Primblecombe, C. Bruhl, C.I. Davidson, R.J. Delmas, G. Gravenhorst, K.O. Munnich, S.A. Penkett, U. Schotterer, J. Schwander, G.E. Shaw, and D. Wagenbach, How Do Glaciers Record Environmental Processes and Preserve Information ?, in *The Environmental Record in Glaciers* ed. by C.C. Langway, Jr. and H. Oeschger, Dahlem Workshop Report, Wiley, New York, 1989.
  14. White, J. W. C., A review of applications of D/H ratios in plants, in *Stable Isotopes in Ecological Systems*, ed. by P. Rundel, J.R. Ehleringer and K.A. Nagy, Springer-Verlag, pp 142-162, 1989.
  15. Johnsen, S.J., W. Dansgaard and J.W.C. White, The Origin of Arctic Precipitation Under Present and Glacial Conditions, *Tellus*, 41B, pp 452-468. 1989.
  16. Dansgaard, W. , J. W. C. White, and S. J. Johnsen, The abrupt termination of the Younger Dryas, *Nature*, 339, pp 532-534. 1989
  17. Koster, R., Jouzel, J., Broecker, W.S., White, J.W. C., Suozzo, R., Russell, G, and Rind, D., The global geochemistry of bomb produced tritium: general circulation models compared to available observations and traditional interpretations, *J. Geophys. Res.*,94,D15, pp 18,305-18,326. 1989.
  18. Petit, J-R., J. W. C. White, N. W. Young, J. Jouzel, and Y. S. Korotkevich, Deuterium Excess in Recent Antarctic Snow, *J. Geophys. Res.*, 96, D3, pp 5113-5122. 1991.
  19. Cook, E.R., L.J. Graumlich, P. Martin, J. Pastor, I.C. Prentice, T.R. Swetnam, K. Valentin, M. Verstraete, T. Webb III, J. White and I. Woodward, Biosphere-Climate Interactions during the Past 18,000 Years: Towards a Global Model of the Terrestrial Biosphere, in *Global Changes of the Past*, ed. by R.S. Bradley, UCAR/OIES. pp 25-42, 1991.
  20. Jouzel, J., R. D. Koster, R. J. Suozzo, G. L. Russell, J. W. C. White, and W. S. Broecker, Simulations of the HDO and H<sub>2</sub>18O Atmospheric Cycles Using the NASA/GISS General Circulation Model: Sensitivity Analyses, *J. Geophys. Res.* vol 96, No. D4, pp7495-7507. 1991.
  21. Lawrence, J. R. and J. W. C. White, The Elusive Climate Signal in the Isotopic Composition of Precipitation, *Geochemical Society Special Publication No.3*, 1992.

22. Taylor, K.C., Lamorey, G.W., Doyle, G.A., Alley, R.B., Grootes, P.M., Mayewski, P.A., White, J.W.C., and Barlow, L.K., The Flickering Switch of Late Wisconsin Climate Change, *Nature*, 361, pp 432-436, 1993.
23. Alley, R.B., Meese, D., Shuman, C.A., Gow, A.J., Taylor, K., Ram, M., Waddington, E.D., White, J.W.C., and Mayewski, P.A., Abrupt accumulation increase at the Younger Dryas termination in the GISP2 ice core, *Nature*, v362, pg527-529, 1993.
24. White, J., Molino, B., Labeyrie, L., Stauffer, B., and Farquhar, G., How Reliable and Consistent are Paleodata from Continents, Oceans, and Ice?, in *Global Changes in the Perspective of the Past*, Eddy, J. and Oeschger, H., eds., Wiley, New York, 1993.
25. Bradley, R., Bard, E., Joussaume, S., Lautenschlager, M., Molino, B., Rashke, R., Shackleton, N., Sirocko, F., Stauffer, B., and White, J., Evaluating Strategies for Reconstructing Global Changes: What and Where are the Gaps?, in *Global Changes in the Perspective of the Past*, Eddy, J. and Oeschger, H., eds., Wiley, New York, 1993.
26. White, J.W.C., 1993, Don't touch that dial. *Nature*, v. 364, p. 186. (Commentary)
27. Andrews, J.T., Dyke, A.S., Tedesco, K., and White, J.W.C., Meltwater along the arctic margin of the Laurentide Ice Sheet (8-12 ka): Stable isotopic evidence and implications for past salinity anomalies, *Geology*, v.21, pg 881-884, 1993.
28. Grootes, P.M., Stuiver, M., White, J.W.C., Johnsen, S.J., and Jouzel, J., Comparison of oxygen isotope records from the GISP2 and GRIP Greenland ice cores, *Nature*, v 366, pp552-554, 1993.
29. Barlow, L.K., White, J.W.C., Barry, R.G., Rogers, J.C., and Grootes, P.M., The North Atlantic oscillation signature in deuterium excess signals in the Greenland Ice Sheet Project 2 ice core, 1840-1970, *Geophys. Res. Lett.*, v. 20, no. 24, pp 2901-2904, 1993.
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32. Benson, L.V. and White, J.W.C., Behavior of the stable isotopes of oxygen and hydrogen in the Truckee River - Pyramid Lake surface water system, Part 3: Source of water vapor over Pyramid Lake, Nevada, *Limnology and Oceanography*, v 39 (8), pp. 1945-1958, 1994.
33. White, J.W.C., Lawrence, J.R., and Broecker, W.S., Modelling and Interpreting D/H Ratios in Tree Rings: A Test Case of White Pine in the Northeastern United States, *Geochim. Cosmochim. Acta*, v 58, pp 851-862, 1994.
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35. Trolier, M., Rockmann, T. and White, J.W.C., Trying the measure  $\delta^{13}\text{C}$  in small samples of atmospheric CH<sub>4</sub>, NOAA/CMDL Annual Report, 1994.
36. White, J.W.C., Ciais, P., Figge, R.A., Kenny, R., and Markgraf, V. Climate in the Pleistocene-Reply, *Nature*; v 371, pp 111-112, 1994.
37. Ciais, P., Francey, R.J., Tans, P.P., White, J.W.C., and Trolier, M., An analytical error estimate for the ocean and land CO<sub>2</sub> uptake using  $\delta^{13}\text{C}$  observations in the atmosphere, NOAA Technical Memorandum ERL CMDL-8, 1995.
38. Shuman, C.A., Alley, R.B., Anandakrishnan, S., White, J.W.C., Grootes, P.M., and Sterns, C.R., Temperature and Accumulation at the Greenland Summit: Comparison of high resolution isotope profiles and passive microwave brightness temperature trends, *J. Geophys. Res.*, vol 100 (D5), pp. 9165-9177, 1995.
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40. White, J.W.C., Environmental studies at the University of Colorado, in *Global Environmental Change Science: Education and Teaching*, NATO ASI Series I: Global Environmental Change, v 29, ed by D.J. Waddington, pp 171-181, 1995.
41. Ciais, P., Tans, P.P., White, J.W.C., Trolier, M., Francey, R.J., Berry, J.A., Randall, D.R., Sellers, P.J., Collatz, J.G., and Schimel, D.S., Partitioning of ocean and land uptake of CO<sub>2</sub> as inferred by  $\delta^{13}\text{C}$  measurements from the NOAA/CMDL global air sampling network, *J. Geophys. Res.*, v 100 (D3), pp. 5051-5070, 1995.

42. Sellstone, C.M, Davis, A., Crockford, G., and White, J.W.C., Use of stable isotopes to differentiate between multiple ground water contaminant sources at a municipal landfill, *Ground Water*, 1995.
43. Figge, R.A. and White, J.W.C., A high resolution Holocene and Late Glacial atmospheric CO<sub>2</sub> record: variability tied to changes in thermohaline circulation, *Global Biogeochem. Cycles*, v 9 n 3, pp 391-405, 1995.
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45. White, J.W.C., Gorodetzky, D., Cook, E.R. and Barlow, L.K., Frequency analysis of an annually resolved, 700 Year paleoclimate record from the GISP2 ice core, in *Climate Variations and Forcing Mechanisms of the Last 2000 years*, NATO ASI Series I: Global Environmental Change, vol 41, P. Jones, R. Bradley, and J. Jouzel, eds., 193-213, 1996.
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47. Trolier, M.; White, J.W.C.; Tans, P.P.; Masarie, K.A.; Gemery, P.A., Monitoring the isotopic composition of atmospheric CO<sub>2</sub>: Measurements from the NOAA Global Air Sampling Network. *Journal of Geophysical Research* 101: 25,897-25,916, 1996.
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51. Jouzel, J., R.B. Alley, K.M. Cuffey, W. Dansgaard, P.M. Grootes, G. Hoffmann, S.J. Johnsen, R.D. Koster, D.A. Peel, C.A. Shuman, M. Stiévenard, M. Stuiver, and J.W.C. White, Validity of the temperature reconstruction from water isotopes in ice cores. *Journal of Geophysical Research* 102:26471-26487, 1997.
52. Shuman, C.A., R.B. Alley, M.A. Fahnestock, P.J. Fawcett, R.A. Bindshadler, J.W.C. White, P.M. Grootes, S. Anandkrishnan, and C.R. Stearns, Detection and monitoring of stratigraphic markers and temperature trends at the Greenland Ice Sheet Project 2 using passive-microwave remote-sensing data. *Journal of Geophysical Research* 102:26877-26886, 1997.
53. White, J.W.C., L.K. Barlow, D. Fisher, P.M. Grootes, J. Jouzel, S.J. Johnsen, M. Stuiver, and H.B. Clausen, The climate signal in the stable isotopes of snow from Summit, Greenland: Results of comparisons with modern climate observations. *Journal of Geophysical Research* 102:26425-26439, 1997.
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55. Ciais, P., A.S. Denning, P.P. Tans, J.A. Berry, D.A. Randall, G.J. Collatz, P.J. Sellers, J.W.C. White, M. Trolier, H.A.J. Meyer, R.J. Francey, P. Monfray, and M. Heimann, A three-dimensional synthesis study of  $\delta^{18}\text{O}$  in atmospheric  $\text{CO}_2$ . 1. Surface fluxes, *J. Geophys. Res.* 102, 5857-5872, 1997.
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**Patents**

U.S. Patent No. 8,181,544: *Liquid Sample Evaporator for Vapor Analysis*  
Issued: May 22, 2012

## **Graduate Students Supervised:**

Pamela Gemery	MS
Lisa Barlow	PhD
Regina Figge	PhD
David Gorodetzky	MS
Brian Kleinhaus	MS
Nan Rosenbloom	PhD
Katie Keller	MS
Kenneth Mack	MS
Francesca Smith	PhD
Ulrike Huber	PhD
Ryan Vachon	PhD
Annalisa Schilla	PhD
Trevor Popp	PhD
Candice Evans	MS
Caroline Alden	PhD
Tyler Jones	PhD
Emily Zakem	MS
Isaac Vimont	PhD
Amy Steiker	MS
Karen Alley	PhD
Erik Noble	PhD
Abby Thayer	PhD

## **Postdoctoral Researchers Supervised:**

Michael Trolier  
Philippe Ciais  
Ray Kenny  
Eric Steig  
Elise Pendall  
John Miller  
Dominic Ferretti  
Lide Tian  
Jacqueline Fluckiger  
Vasilii Petrenko  
Yarrow Axford  
Vasileios Gkinis  
Tyler Jones



### **Current Stable Isotope Lab Staff:**

Bruce Vaughn

Sylvia Englund

Valerie Morris

Rachel Edie

Owen Sherwood

(about 50 undergraduates have worked in the lab; generally 2 to 4 per year)

### **Recent Courses Taught at the University of Colorado**

Spring 1998	Environmental Issues, GEOL 3520 Global Change, GEOL 1070 Global Change Laboratory, GEOL 1110 (supervise TA's)
Fall 1998	Stable Isotope Geochemistry, GEOL 5750
Spring 1999	Environmental Issues, GEOL 3520 Global Change, GEOL 1070 Global Change Laboratory, GEOL 1110, 3 sections
Spring 2000	ENVS 3930, Internship in ENVS, supervisor GEOL 3520, Environmental Issues GEOL 1070, Global Change GEOL 1110, Global Change Lab, supervise TA's
Fall 2000	ENVS 4990, Senior thesis in ENVS ENVS 3930, Internship in ENVS, supervisor
Spring 2001	ENVS 3930, Internship in ENVS, supervisor GEOL 3520, Environmental Issues GEOL 1070, Global Change GEOL 1110, Global Change Lab, supervise TA's
Fall 2001	ENVS 4990, Senior thesis in ENVS ENVS 3930, Internship in ENVS, supervisor
Spring 2002	ENVS 4990, Senior thesis in ENVS GEOL 1070, Global Change GEOL 3520, Environmental Issues GEOL 1110, Global Change Lab, supervise TA's ENVS 3930, Internship in ENVS

Fall 2002	ENVS 4990, Senior thesis in ENVS ENVS 3930, Internship in ENVS GEOL 5700, Environmental Isotopes
Spring 2003	ENVS 4990, Senior thesis in ENVS GEOL 1070, Global Change GEOL 3520, Environmental Issues GEOL 1110, Global Change Lab, supervise TA's ENVS 3930, Internship in ENVS
Fall 2003	ENVS 4990, Senior thesis in ENVS ENVS 3930, Internship in ENVS
Spring 2004	ENVS 4990, Senior thesis in ENVS ENVS 1000, Intro. To Environmental Studies GEOL 3520, Environmental Issues ENVS 3930, Internship in ENVS
Fall 2004	ENVS 4990, Senior thesis in ENVS ENVS 3930, Internship in ENVS ENVS 5900, Carbon, Climate and Society
Spring 2005	ENVS 4990, Senior thesis in ENVS ENVS 1000, Intro. To Environmental Studies GEOL/ENVS 3520, Environmental Issues ENVS 5100 Carbon, Climate and Society
Fall 2005	On sabbatical
Spring 2006	On sabbatical
Fall 2006	ENVS 1000, Intro. To Environmental Studies
Spring 2007	GEOL/ENVS 3520 Environmental Issues
Spring 2008	ENVS 1000, Intro. To Environmental Studies
Spring 2009	ENVS 1000, Intro. To Environmental Studies GEOL/ENVS 3520 Environmental Issues
Spring 2010	ENVS 1000, Intro. To Environmental Studies

Spring 2011	GEOL/ENVS 3520 Energy and Climate Change
Spring 2012	GEOL/ENVS 3520 Energy and Climate Change
Spring 2013	GEOL/ENVS 3520 Energy and Climate Change
Spring 2014	On sabbatical
Spring 2015	ENVS 1000, Intro. To Environmental Studies GEOL/ENVS 3520 Environmental Issues
Spring 2016	ENVS 1000, Intro. To Environmental Studies GEOL/ENVS 3520 Environmental Issues
Fall 2016	ENVS 1000, Intro. To Environmental Studies

## **Service**

### **Selected Service at the University of Colorado:**

- Director, Environmental Studies Program, College of Arts and Sciences, 1994 to summer 2005, Fall 2006.
- Co-Director, International Ice Core Data Cooperative (NOAA/NSF) 1996 to 2001
- Director, National Ice Core Laboratory, NSF facility 1996-97
- Member, Environmental Program Advisory Committee 1994 to present
- Member, Honors Council, 1996 to present
- Director, Institute of Arctic and Alpine Research, 2007 (interim), 2008 to present
- Vice Chancellor's Advisory Committee, 2004 to 2008
- Academic Affairs Budget Advisory Committee, 2008 to present
- Geosciences Initiative Steering Committee, co-Chair, 2008 to present

- Campus Master Plan, East Campus Vision Subcommittee, Chair, 2009 to 2011
- Faculty lead, Geosciences/SEEC Building Program Plan Committees, 2007 to present
- Numerous committees for the Department of Geological Sciences, for the Institute of Arctic and Alpine Research, and for the Environmental Studies Program, including search committees, executive committees, graduate committees, etc.
- Numerous committees for the College of Arts and Sciences, for the Graduate School, and for the University of Colorado, including Internal Program Review Committees, the Task Force for the Life Sciences, and search committees for Director of Program in Writing and Rhetoric, for the Director of Environment and Behavior Program in Institute of Behavioral Sciences, the Director the Baker Hall Residential Academic Program, the Associate Vice Chancellor for Research, and the Education Outreach Coordinator.

**Selected National and International Service:**

- U.S. Ice Core Working Group (Member, 1989 to 1992; Chair, 1992 to 1996)
- Member, Committee of Visitors (COV), NSF OPP advisory panel for Polar Operations, 1994
- Member, NSF/OPP Advisory Panel, 1994-1997.
- Selection committee for the Director of Geophysical Institute, Niels Bohr Institute, University of Copenhagen, 1994
- Global Change Subcommittee, Planning Group 2, Scientific Committee on Antarctic Research (SCAR) (1993 to 1996)
- Experts panel on isotopic measurements on trace gases in the atmosphere; International Atomic Energy Agency (IAEA) (1992 to 1996)
- Organized and chaired sessions at Fall and Spring meetings of American Geophysical Union, 1995 to present
- Member of Paleoceanography Committee, American Geophysical Union, 1995 to 1998

- Chair, Committee of Visitors, Office of Polar Programs, National Science Foundation 1997
- Member, ISOMAP coordination committee (isotopes in precipitation program sponsored by World Meteorological Org. and International Geosphere Biosphere Program) 1999 to 2001
- Member, Columbia University Biosphere2 Advisory Committee (1999 to 2002)
- Chair, Science Advisory Board for Ice Core Drilling Services (ICDS) at University of Wisconsin, Madison, (2000 to 2004. Member, 2004 to 2010)
- Member, National Research Council Committee on Subglacial Lakes, 2005 to 2007.
- Polar Research Board, Committee of the National Academy of Sciences. Member, 2005 to 2008; Chair, 2008 to 2014.
- Member, US Global Change Research Program Synthesis and Assessment Product 1.2, Past Climate Variability and Change in the Arctic and at High Latitudes, 2008-2009.
- Co-organizer, Weather Summit, Steamboat Springs, Colorado, 2009 to present
- Entelligent, Inc., Boulder, CO, Scientific Advisory Board, 2014 to present
- Picarro Innovators Council, 2010 to 2015
- Chair, Abrupt Climate Change, National Academy of Sciences study, 2012 to 2014.
- Chair, Anthropogenic Methane Emissions in the United States: Improving Measurement, Monitoring, Presentation of Results, and Development of Inventories, 2016-2018

Brief Statement of teaching, research and service interests

My teaching interests at the undergraduate level focus on human interactions with the environment, as well as general geosciences. I have a strong commitment to undergraduate education in this area, as I believe that an educated citizenry is important in ensuring that reasonable environmental policy is made and implemented. I teach and helped to develop a large lecture class, Introduction to Environmental Studies (ENVS 1000). This course covers the broad spectrum of environmental studies, from the social to the natural sciences. In addition, I developed and teach a large upper level undergraduate course, GEOL 3520, Environmental Issues. This course addresses our present and future energy sources, and how those energy sources affect the Earth's systems, including climate and biogeochemistry. At the graduate level, I teach courses in my research specialty, stable isotope geochemistry and biogeochemistry. I have also taught the ENVS Honor's course, and supervised the ENVS Internship Program. I have also been relatively successful in securing funding for education at CU. With a number of other faculty at CU, I have had grants funded by NASA (Earth System Science Education), as well as a multi-million dollar NSF-IGERT graduate training grant. This grant supported 13 graduate students per year for five years in an experiment in team building, disciplinary silo breaking, and co-educating social science, natural science, and journalism graduate students in carbon cycle dynamics, economics and policy.

My research interests are broad, but all revolve around the use of environmental stable isotope ratios. I operate and maintain a laboratory for the analysis of stable isotope ratios of carbon, hydrogen, nitrogen, oxygen and sulfur ([instaar.colorado.edu/sil](http://instaar.colorado.edu/sil)). My specific areas of research include modeling the global carbon cycle using isotope ratios in atmospheric carbon dioxide and methane, development of techniques for measuring isotope ratios in atmospheric gases, reconstructions of paleo-environmental conditions using isotopes in ice cores, reconstructions of past environments from isotopes in organic materials, and tracing of ground water flow and recharge. I have been a member of several deep ice coring projects in Greenland (GISP2, NorthGRIP, and NEEM) and Antarctica (Siple Dome and Inland WAIS). I am also an affiliate of NOAA and work closely with the Carbon Cycle Group there. Starting in the late 1980's, my ice core research has helped to show that large climate changes tend to occur in the natural system as abrupt and rapid shifts in mode probably driven by internal adjustments in the Earth climate system, rather than slow and gradual adjustments to changing external conditions, such as the amount of energy received from the sun. Shifts of more than 10°C in mean temperature in less than a human lifetime are common in the paleoclimate record, and serve as a warning that adaptation to future climate changes may not be easy. My research in isotopes in the carbon cycle has also helped to show that land plants are capable of removing large amounts of carbon dioxide from the atmosphere, amounts that equal our input of CO<sub>2</sub> from fossil fuel burning on short time scales. Such large changes in the uptake of CO<sub>2</sub> by plants is a key piece in the puzzle we must solve to formulate workable policy on CO<sub>2</sub> levels and climate change.

I was the founding Director of the Environmental Studies Program (ENVS) in the College of Arts and Sciences and grew the Program from its inception in 1994 until July of 2005. This is an interdisciplinary program granting a Bachelor's degree, a Masters, a PhD, and dual masters with Law and Business. There are currently a dozen faculty, more than 800 undergraduate majors, and 50 graduate students in the Program. The Program has faculty from the physical and social sciences, business, engineering and journalism. This program is based on the philosophy that if we are to effectively train the environmental problem solvers of the future, we must integrate education in the physical working of the Earth with education in the political, economic and social forces that drive human behavior. Environmental Studies at CU-Boulder is part of the national trend towards interdisciplinary education in the environment. CU-Boulder is an acknowledged national leader in this trend and our excellence in research in this area is well documented. My goal as Director of ENVS was to put our interdisciplinary teaching efforts in environmental studies at CU Boulder, both undergraduate and graduate, on the same level of excellence as our research efforts in this important new field.