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CURRICULUM VITAE

Name David Thomas Tissue

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Education

Ph.D.	1989	University of California, Los Angeles, Department of Biology Committee Chairman: Dr. Park Nobel
M.Sc.	1984	San Diego State University, Department of Biology Committee Chairman: Dr. Walt Oechel
B.Sc.	1980	McGill University, Department of Biology, Montreal, Canada

Professional Experience

2002-date	Associate Professor, Biology, Texas Tech University
2004	Research Scientist (Sabbatical), Landcare Research, New Zealand
2001-date	Associate Research Scientist (Adjunct), Columbia University, Lamont-Doherty
1996-2001	Assistant Professor, Biology, Texas Tech University
1991-1996	Research Associate, Botany/Phytotron, Duke University
1990	Research Fellow, Smithsonian Tropical Research Institute, Panama
1985-1989	Ph.D. Research, University of California, Los Angeles
1982-1984	Masters Research, San Diego State University
1980-1982	Staff Biologist, Boyle Engineering Corporation, California

Grants and Fellowships

1. *Steven A. Vavra Graduate Fellowship*. 1986-1988. Influence of parent-ramet connections in *Agave deserti* on growth and reproduction. $24,000.

2. *UCLA Graduate Fellowship*. 1988. Carbon relations of flowering in *Agave deserti*. $3,400.

3. *Associated Western Universities Graduate Fellowship*. 1988-1989. Physiological integration of parents and ramets of *Agave deserti*: carbon relations during vegetative and reproductive growth. $12,000.

4. *Smithsonian Tropical Research Institute*. 1990. Flowering in *Psychotria*: the role of total nonstructural carbohydrates. $3,500.

5. *Research Enhancement Fund, Texas Tech University*. 1996-1997. Interactive effects of phosphorus and CO_2 on growth and photosynthesis in cottonwood. PI. (J. Lewis) $3,300.

6. *US Department of Energy, Oak Ridge National Lab*. 1996-1998. Physiological and biochemical mechanisms controlling sugar maple and red maple tree response to elevated CO_2. PI. $17,447.

7. *US Department of Energy, Program for Ecosystem Research*. 1996-1999. Response of Mediterranean-type ecosystems to elevated atmospheric CO_2 and associated climate change. Co-Investigator (WC Oechel, PI), $600,000.

8. *National Science Foundation, Division of International Programs*. 1996-1999. Biochemical mechanisms controlling leaf expansion and tree response to elevated CO_2. PI (K. Griffin), $33,000.

9. *Big 12 Faculty Fellowship*. 1997. Visit to laboratory of Dr. William Adams III, University of Colorado, Boulder. Co-PI (A.S. Holaday), $2,500.

10. *US Department of Energy, Terrestrial Ecology and Global Change Program.* 1997-2001. Source-sink feedbacks in foliar CO_2 exchange in a sweetgum stand exposed to Free-Air CO_2 Enrichment (FACE). Co-PI (C. Gunderson, R. Norby), $530,634.

11. *Columbia University, Center for Environmental Research and Conservation*. 1998-1999. Native New Zealand conifers: Has 150 million years of isolation resulted in unique physiological function? Co-PI (K. Griffin, W. Schuster, M. Turnbull, D. Whitehead), $9,000.

12. *Andrew W. Mellon Foundation*. 1998-2002. Environmental controls on tree growth: A comparison between the Cascade Brook watershed of Black Rock Forest, NY and a native New Zealand forest. Co-Investigator (K. Griffin, M. Turnbull, D. Whitehead), $247,600.

13. *Columbia University, Center for Environmental Research and Conservation*. 1999-2000. Native New Zealand conifers: The implications of 150 million years of isolation and unique physiological function. Co-PI (K. Griffin, W. Schuster, M. Turnbull, D. Whitehead), $19,980.

14. *Fordham University, Louis Calder Biological Field Station*. 1999-2000. Effects of increasing atmospheric CO_2 on mycorrhizal colonization in cottonwood trees. Co-PI (J. Lewis), $3,500.

15. *Advanced Technology Program, Texas*. 1999-2002. Development of stress tolerant cotton. Co-PI (R. Allen), $147,000.

16. *NASA*. 2000-2001. Plant carbon allocation and partitioning of metabolites in a closed growth facility. Co-PI (E. Peffley, C. Green, P. Pare, L. Thompson), $376,813.

17. *NASA*. 2001-2002. Plant carbon allocation and partitioning of metabolites in a closed growth facility (renewal). Co-PI (E. Peffley, C. Green, P. Pare, L. Thompson), $402,797 (Renewal).

18. *National Science Foundation, Ecological and Evolutionary Physiology*. 2002-2005. Regulation of plant responses to elevated CO_2 by developmental and physiological processes. Co-PI (J. Lewis, K. Griffin), $225,000.

19. *Technology Development and Transfer, Texas.* 2002-2003. Development of high-yielding, drought tolerant cotton. Co-PI (R. Allen) $185,000.

20. *National Center for Ecological Analysis and Synthesis, Working Group*. 2002-2004. PrecipNet: A national network for precipitation and ecosystem change. Co-PI (M. Loik PI with 14 Co-PIs) $55,000.

21. *National Science Foundation, International Program.* 2002-2005. Collaborative Research: The contribution of woody tissue respiration to the carbon balance of an ancient podocarp forest ecosystem. Co-PI (K. Griffin), $25,000.

22. *National Park Service*. 2003-2006. Effects of atmospheric nitrogen and climate change on desert ecosystems. Co-PI (J. Zak, M. Loik), $97,530.

23. *NASA*. 2002-2003. Plant carbon allocation and partitioning of metabolites in a closed growth facility (renewal). Co-PI (E. Peffley, C. Green, P. Pare, L. Thompson), $400,000.

24. *National Parks Ecological Research Fellowship Program*. 2003-2006. Energetic processes and their responses to environmental change: Potential impacts on desert plant communities in Big Bend National Park. Co-PI (J. Nagel), $150,000.

25. *Black Rock Forest Consortium*. 2003. The potential role of physiology in the age-related decline of red oak productivity at Black Rock Forest. Co-PI (Griffin, Turnbull), $9,100.

26. *Southwest Consortium*. 2003-2006. Toward the protection of photosynthetic capacity in cotton at sub-optimal and supra-optimal temperature. Co-PI (Holaday, Allen, Logan), $54,367.

27. *NASA*. 2003-2005. Plant carbon allocation and partitioning of metabolites in a closed growth facility (renewal). Co-PI (E. Peffley, C. Green, P. Pare, L. Thompson), $580,000.

28. *USDA*. 2005. Impact of varying irrigation timing and magnitude on peanut growth and physiology. PI, $10,000.

Grants and Fellowships in Review

1. *NSF, Ecosystem Sciences*. 2006-2009. Collaborative Research: Comparative response of the four major North American deserts to changes in the magnitude and timing of precipitation. PI (Loik, Huxman, Smith). PI, $2,930,646 (submitted July 2005).

2. *NSF, Ecological and Evolutionary Physiology*. 2006-2009. Collaborative Research: Examining the Physiological Basis for the Contrasting Effects of Eastern Dwarf Mistletoe Infection on its Three Host Spruce Species. Co-PI (Logan, Phillips). $361,904 (submitted July 2005).

3. *NASA*. 2006-2007. Impact of elevated CO2 and planting density on Allium: Consequences for physiology, growth and nutritional composition. Co-PI (Peffley, Pare, Thompson). $500,000 (submitted July 2005).

Research Interests

Physiological plant ecology
CO_2 and global climate change effects on plant and ecosystem carbon balance

Teaching Experience

Biology of Plants
Physiological Plant Ecology
Plant Physiology
Seminar - Global Change Biology

Professional Memberships

Ecological Society of America
Botanical Society of America
Sigma Xi

Professional Activities

Reviewed manuscripts- American Journal of Botany, American Midland Naturalist, Australian Journal of Plant Physiology, Ecological Applications, Ecology, Ecology Letters, Functional Ecology, Global Change Biology, Journal of Experimental Botany, Journal of Plant Science, New Phytologist, Oecologia, Plant Cell and Environment, Plant Physiology, Science, Tree Physiology, Trends in Plant Science.

Board of Advisors - New Phytologist (2001-present)
Editorial Review Board Member - Tree Physiology (1997-present)
Board of Editors – Tree Physiology (2003-present)

Reviewed proposals- Department of Energy (National Institute for Global Environmental Change; Program for Ecosystem Research), National Science Foundation (Ecological and Evolutionary Physiology; Ecosystems), National Aeronautics and Space Administration, US Department of Agriculture (Plant Response to the Environment), Natural Environment Research Council (United Kingdom)

Panel member - National Science Foundation (Ecological & Evolutionary Physiology, Oct 1999)
Panel member - Department of Energy (Program in Ecosystem Research), Dec. 2001, May 2004
Panel member - Department of Energy (NIGEC), May 2002

Publications

1. Tissue, D.T. and W.C. Oechel. 1987. Physiological and growth response of *Eriophorum vaginatum* to field elevated CO_2 and temperature in the Alaskan tussock tundra. *Ecology* 68: 401-410.

2. Tissue, D.T. and P.S. Nobel. 1988. Parent-ramet connections in *Agave deserti*: influences of carbohydrates on growth. *Oecologia* 75: 266-271.

3. Tissue, D.T. and P.S. Nobel. 1990. Carbon translocation between parents and ramets of a desert perennial. *Annals of Botany* 66: 551-557.

4. Tissue, D.T. and P.S. Nobel. 1990. Carbon relations of flowering in a semelparous clonal desert perennial. *Ecology* 71: 273-281.

5. Tissue, D.T., D. Yakir and P.S. Nobel. 1991. Diel water movement between parenchyma and chlorenchyma of two desert CAM plants under dry and wet conditions. *Plant, Cell and Environment* 14: 407-413.

6. Tissue, D.T., R.B. Thomas and B.R. Strain. 1993. Long-term effects of elevated CO_2 and nutrients on photosynthesis and rubisco in loblolly pine seedlings. *Plant, Cell and Environment*. 16: 859-865.

7. Oechel, W.C., S. Cowles, N. Grulke, S. Hastings, W. Lawrence, T. Prudhomme, G. Riechers, B. Strain, D. Tissue and G. Vourlitis. 1994. Transient nature of CO_2 fertilization in arctic tundra. *Nature* 371: 500-503.

8. Dippery, J.K., D.T. Tissue, R.B. Thomas and B.R. Strain. 1995. Effects of low and elevated CO_2 on C_3 and C_4 annuals. I. Growth and biomass allocation. *Oecologia* 101: 13-20.

9. Tissue, D.T., K.L. Griffin, R.B. Thomas and B.R. Strain. 1995. Effects of low and elevated CO_2 on C_3 and C_4 annuals. II. Photosynthesis and leaf biochemistry. *Oecologia* 101: 21-28.

10. Tissue, D.T. and S.J. Wright. 1995. Effect of seasonal water availability on phenology and the annual shoot carbohydrate cycle of tropical forest shrubs. *Functional Ecology* 9: 518-527.

11. Tissue, D.T., J.B. Skillman, E.P. McDonald and B.R. Strain. 1995. Photosynthesis and carbon allocation in *Tipularia discolor* (Orchidaceae), a wintergreen understory herb. *American Journal of Botany* 82: 1249-1256.

12. Tissue, D.T., R.B. Thomas and B.R. Strain. 1996. Growth and photosynthesis of loblolly pine (*Pinus taeda* L.) after exposure to elevated CO_2 for 19 months in the field. *Tree Physiology* 16: 49-59.

13. Lewis, J.D., D.T. Tissue and B.R. Strain. 1996. Seasonal response of photosynthesis to elevated CO_2 in loblolly pine (*Pinus taeda* L.) over two growing seasons. *Global Change Biology* 2: 103-114.

14. Luo, Y., D.A. Sims, R.B. Thomas, D.T. Tissue and J.T. Ball. 1996. Sensitivity of leaf photosynthesis to CO_2 concentration is an invariant function for C3 plants: A test with experimental data and global applications. *Global Biogeochemical Cycles* 10: 209-222.

15. BassiriRad, H., D.T. Tissue, J.F. Reynolds, F.S. Chapin, III. 1996. Response of *Eriophorum vaginatum* to CO_2 enrichment at different soil temperatures: Effects on growth, root respiration and $^{32}PO_4^{-3}$ uptake kinetics. *New Phytologist* 133: 423-430.

16. Tissue, D.T., J.P. Megonigal and R.B. Thomas. 1997. Nitrogenase activity and N_2-fixation are stimulated by elevated CO_2 in a tropical N_2-fixing tree. *Oecologia* 109: 28-33.

17. Tissue, D.T., R.B. Thomas and B.R. Strain. 1997. Atmospheric CO_2 enrichment increases growth and photosynthesis of *Pinus taeda*: A four-year experiment in the field. *Plant, Cell and Environment* 20: 1123-1134.

18. Reid, C.D., D.T. Tissue, E.L. Fiscus and B.R. Strain. 1997. Comparison of spectrophotometric and radioisotopic methods for the assay of Rubisco in ozone-treated plants. *Physiologia Plantarum* 101: 398-404.

19. Johnson, D.W., R.B. Thomas, K.L. Griffin, D.T. Tissue, J.T. Ball, B.R. Strain and R.F. Walker. 1998. Effects of CO_2 and N on growth and N uptake in ponderosa and loblolly pine. *Journal of Environmental Quality* 27:414-425.

20. Cook, A.C., D.T. Tissue, S.W. Roberts and W.C. Oechel. 1998. Effects of long-term elevated CO_2 from natural CO_2 springs on *Nardus stricta*: photosynthesis, biochemistry, growth and phenology. *Plant, Cell and Environment* 21:417-425.

21. Turnbull, M.H., D.T. Tissue, K.L. Griffin, G.N.D. Rogers and D. Whitehead. 1998. Photosynthetic acclimation to long-term exposure to elevated CO_2 in *Pinus radiata* Don. is related to age of needles. *Plant, Cell and Environment* 21:1019-1028.

22. Pataki, D.E., R. Oren and D.T. Tissue. 1998. Elevated carbon dioxide does not affect average canopy stomatal conductance of *Pinus taeda* L. *Oecologia* 117:47-52.

23. Tissue, D.T., K.L. Griffin and J.T. Ball. 1999. Photosynthetic adjustment in field-grown ponderosa pine trees after six years exposure to elevated CO_2. *Tree Physiology* 19:221-228.

24. Peterson, A.G., J.T. Ball, Y. Luo, C.B. Field, P.B. Reich, P.S. Curtis, K.L. Griffin, C.A. Gunderson, R.B. Norby, D.T. Tissue, M. Forstreuter, A. Rey, C. Vogel and CMEAL participants. 1999. The photosynthesis-leaf nitrogen relationship at ambient and elevated atmospheric carbon dioxide: a meta-analysis. *Global Change Biology* 5:331-346.

25. Megonigal, J.P., S.C. Whalen, D.T. Tissue, B. D. Bovard, D. B. Albert and A. Allen. 1999. A plant-soil-atmosphere microcosm for tracing radiocarbon from photosynthesis through methanogenesis. *Soil Science Society of America Journal* 63:665-671.

26. Peterson, A.G., J.T. Ball, Y. Luo, C.B. Field, P.S. Curtis, K.L. Griffin, C.A. Gunderson, R.J. Norby, D.T. Tissue, M. Forstreuter, A. Rey, C.S. Vogel and CMEAL participants. 1999. Quantifying the response of photosynthesis to changes in leaf nitrogen content and leaf mass per area in plants grown under atmospheric CO_2 enrichment. *Plant, Cell and Environment* 22:1109-1119.

27. Ward, J.K., D.T. Tissue, R.B. Thomas and B.R. Strain. 1999. Comparative responses of model C_3 and C_4 plants to drought in low and elevated CO_2. *Global Change Biology* 5:857-867.

28. Griffin, K.L., D.T. Tissue, M.H. Turnbull and D. Whitehead. 2000. The onset of photosynthetic acclimation to elevated CO_2 partial pressure in field grown *Pinus radiata* Don. after 4 years. *Plant Cell Environment* 23:1089-1098.

29. Stylinski, C.D., W.C. Oechel, J.A. Gamon, D.T. Tissue, F. Miglietta, A. Raschi. 2000. Effects of lifelong CO_2 enrichment on carboxylation and light utilization of *Quercus pubescens* Willd. examined with gas exchange, biochemistry and optical techniques. *Plant Cell Environment* 23:1353-1362.

30. Griffin, K.L, O.R. Anderson, M.D. Gastrich, J.D. Lewis, G. Lin, W. Schuster, J. Seemann, D.T. Tissue, M.T. Turnbull and D. Whitehead. 2001. Plant growth in elevated CO_2 alters mitochondrial number and chloroplast fine structure. *Proceedings of the National Academy of Science* 98:2473-2478.

31. Wang, X.Z., J.D. Lewis, D.T. Tissue, J.R. Seemann and K.L. Griffin. 2001. Effects of elevated atmospheric CO_2 concentration on leaf respiration of *Xanthium strumarium* in light and in darkness. *Proceedings of the National Academy of Science* 98:2479-2484.

32. Turnbull, M.H., D. Whitehead, D.T. Tissue, W. Schuster, K.J. Brown and K.L. Griffin. 2001. The response of leaf respiration to temperature and leaf characteristics in three deciduous tree species differs at sites of contrasting soil availability. *Tree Physiology* 21:571-578.

33. Tissue, D.T., K.L. Griffin, M.H. Turnbull and D. Whitehead. 2001. Canopy position and needle age affect photosynthetic response in field-grown *Pinus radiata* D. Don after 5 years of exposure to elevated CO_2 partial pressure. *Tree Physiology* 21:915-923.

34. Griffin, K.L, D.T. Tissue, M.H. Turnbull, W. Schuster and D. Whitehead. 2001. Leaf dark respiration as a function of canopy position in *Nothofagus fusca* trees grown at ambient and elevated CO_2 partial pressures for six years. *Functional Ecology* 15:497-505.

35. Whitehead, D., G. Hall, A. Walcroft, K. Brown, J. Landsberg, D. Tissue, M. Turnbull, K. Griffin, W. Schuster, F. Carswell, I. James and D. Norton. 2002. Analysis of the growth of rimu (*Dacrydium cupressinum*) in south Westland, New Zealand, using process-based simulation models. *International Journal of Biometeorology* 46:66-75.

36. Lewis, J.D., X.Z. Wang, K.L. Griffin and D.T. Tissue. 2002. Effects of age and ontogeny on photosynthetic responses of a determinate annual plant to elevated CO_2 partial pressures. *Plant Cell Environment* 25:359-368.

37. Gunderson, C.A., J. D. Sholtis, S.D. Wullschleger, D.T. Tissue, P.J. Hanson and R.J. Norby. 2002. Environmental and stomatal influences on photosynthetic response to CO_2 enrichment in *Liquidambar styraciflua* L. during three growing seasons. *Plant Cell Environment* 25:379-393.

38. Nagel, J.M., K.L. Griffin, K.J. Brown, W.S.F. Schuster, D.T. Tissue, M.H. Turnbull and D. Whitehead. 2002. Energy investment in leaves of red maple and co-occurring oaks within a forested watershed. *Tree Physiology* 22:859-867.

39. Turnbull, M.H., D. Whitehead, D.T. Tissue, W.S.F. Schuster, K.J. Brown, V.C. Engel and K.L. Griffin. 2002. Photosynthetic characteristics in canopies of *Quercus rubra*, *Quercus prinus* and *Acer rubrum* differ in response to soil water availability. *Oecologia* 130:515-524.

40. Tissue, D.T., J.D. Lewis, S.D. Wullschleger, J.S. Amthor, K.L. Griffin and O.R. Anderson. 2002. Leaf respiration at different canopy positions in sweetgum (*Liquidambar styraciflua*) grown in ambient and elevated concentrations of carbon dioxide in the field. *Tree Physiology* 22:1157-1166.

41. Weltzin, J.F. and D.T. Tissue. 2003. Resource pulses in arid environments – patterns of rain, patterns of life. *New Phytologist* 157:171-173.

42. Turnbull, M.H., D. Whitehead, D.T. Tissue, W.S.F. Schuster, K.J. Brown and K.L. Griffin. 2003. Scaling foliar respiration in two contrasting forest canopies. *Functional Ecology* 17:101-114.

43. Lewis, J.D., X. Wang, K.L. Griffin and D.T. Tissue. 2003. Age at flowering differentially affects vegetative and reproductive responses of a determinate annual plant to elevated carbon dioxide. *Oecologia* 135:194-201.

44. Logan, B.A., E.R. Huhn and D.T. Tissue. 2003. Photosynthetic characteristics of eastern dwarf mistletoe (*Arceuthobium pusillum* Peck) and its effects on the needles of host white spruce (*Picea glauca* (Moench) Voss). *Plant Biology* 4:740-745.

45. Yan, J., J. Wang, D. Tissue, A.S. Holaday, R. Allen and H. Zhang. 2003. Photosynthesis and seed production under water-deficit conditions in transgenic tobacco plants that over-express an *Arabidopsis* ascorbate peroxidase gene. *Crop Science* 43:1477-1483.

46. DeLucia, E.H., M.H. Turnbull, A.S. Walcroft, K.L. Griffin, D.T. Tissue, D. Glenny, T.M. McSeveny and D. Whitehead. 2003. The contribution of bryophytes to the carbon balance of a temperate rainforest. *Global Change Biology* 9:1158-1170.

47. Weltzin, J.F., M.E. Loik, S. Schwinning, D.G. Williams, P. Fay, B. Haddad, J. Harte, T.E. Huxman, A.K. Knapp, G. Lin, W.T. Pockman, M.R. Shaw, E. Small, M.D. Smith, S.D. Smith, D.T. Tissue and J.C. Zak. 2003. Assessing the response of terrestrial ecosystems to potential changes in precipitation. *Bioscience* 53:941-952.

48. Turnbull, M.H., D.T. Tissue, R. Murthy, X. Wang and K.L. Griffin. 2004. Nocturnal warming increases photosynthesis at elevated CO_2 partial pressure in *Populus deltoides*. *New Phytologist* 161:819-826.

49. Griffin, K.L., O.R. Anderson, D.T. Tissue, M.H. Turnbull and D. Whitehead. 2004. Variation in dark respiration and mitochondrial numbers within needles of *Pinus radiata* grown in ambient or elevated CO_2 partial pressure. *Tree Physiology* 24:347-353.

50. Whitehead, D., A.S. Walcroft, K.L. Griffin, D.T. Tissue, M.H. Turnbull, V. Engel, K.J. Brown, W.S.F. Schuster. 2004. Scaling carbon uptake from leaves to canopies: insights from two forests with contrasting properties. Chapter 15 in *Forests at the Land-Atmosphere Interface*. Edited by M. Mencuccini, J. Grace, J. Moncrieff and K.G. McNaughton. Pages 231-254. CAB International, Oxford.

51. Whitehead, D., K.L. Griffin, M.H. Turnbull, D.T. Tissue, V.C. Engel, K.J. Brown, W.S.F. Schuster and A.S. Walcroft. 2004. Response of total night-time respiration to differences in total daily photosynthesis in a canopy of *Quercus rubra* L. *Global Change Biology* 10:925-938.

52. Jasoni, R., C. Kane, C. Green, E. Peffley, D. Tissue, L. Thompson, P. Payton and P.Pare. 2004. Altered leaf and root emissions from onion (*Allium cepa* L.) grown under elevated CO_2 conditions. *Environmental and Experimental Botany* 51:273-280.

53. Sholtis, J.D., C.A. Gunderson, R.J. Norby and D.T. Tissue. 2004. Persistent stimulation of photosynthesis by elevated CO_2 in a sweetgum (*Liquidambar styraciflua*) forest stand. *New Phytologist* 162:343-354.

54. Shapiro, J.B, K. L. Griffin, J.D. Lewis, and D.T. Tissue. 2004. Response of leaf respiration in the light of *Xanthium strumarium* to elevated CO_2 concentration, nitrogen availability and temperature. *New Phytologist* 162:377-386.

55. Huxman, T.E., M.D. Smith, P.A. Fay, A.K. Knapp, M. R. Shaw, M. E. Loik, S. D. Smith, D. T. Tissue, J. C. Zak, J. F. Weltzin, W. T. Pockman, O. E. Sala, B. Haddad, J. Harte, G. W. Koch, S. Schwinning, E. E. Small, and D. G. Williams. 2004. Convergence across biomes to a common rain-use efficiency. *Nature* 429:641-645.

56. Huxman, T.E., K. Snyder, D. Tissue, J. Leffler, K. Ogle, W. Pockman, D. Sandquist and D. Potts. 2004. Precipitation pulses and carbon fluxes in semi-arid and arid ecosystems. *Oecologia* 141:254-268.

57. Thompson, L., E. Peffley, C. Green, P. Pare and D. Tissue. 2004. Biomass, flavonol levels and sensory characteristics of *Allium* cultivars grown hydroponically at ambient and elevated CO2. *SAE International* 041ICES-136.

58. Pare, P.W., R. Jasoni, E. Peffley, L. Thompson, D. Tissue and C. Green. 2004. Elevated carbon dioxide alters hydrocarbon emissions and flavor in onion. *SAE International* 2004-01-2299.

59. Tissue, D.T., K.L. Griffin, M.H. Turnbull and D. Whitehead. 2005. Stomatal and biochemical limitations to photosynthesis in a temperate rainforest dominated by *Dacrydium cupressinum* in New Zealand. *Tree Physiology* 25:447-456.

60. Thompson, L., J. Morris, E. Peffley, C. Green, P. Pare, D. Tissue, R. Jasoni, J. Hutson, B. Wehner and C. Kane. 2005. Flavonol content and composition of spring onions grown hydroponically or in potting soil. *Journal of Food Composition and Analysis* 18:635-645.

61. Turnbull, M.H., D.T. Tissue, K.L. Griffin S.J. Richardson, D.A. Peltzer and D. Whitehead. 2005. Respiration characteristics in temperate rainforest tree species differ along a long-term soil-development chronosequence. *Oecologia* 143:271-279.

62. Whitehead, D., N.T. Boelman, M.H. Turnbull, K.L. Griffin, D.T. Tissue, M.M. Barbour, J.E. Hunt, S.J. Richardson and D.A. Peltzer. 2005. Photosynthesis and reflectance indices for rainforest species in ecosystems undergoing progression and retrogression along a soil fertility chronosequence in New Zealand. *Oecologia* 144:233-244.

63. Nagel, J.M., X. Wang, J.D. Lewis, H.A. Fung, D.T. Tissue and K.L. Griffin. 2005. Atmospheric CO_2 enrichment alters energy assimilation, investment and allocation in *Xanthium strumarium*. *New Phytologist* 166:513-523.

64. Kane, C.D., R.L. Jasoni, E.P. Peffley, L.D. Thompson, C.J. Green, P. Pare and D.T. Tissue. 2005. Nutrient solution and solution pH influences onion growth and mineral content. *Journal of Plant Nutrition* (in press).

65. Yee, D.A. and D.T. Tissue. 2005. Relationships between non-structural carbohydrates and flowering in a sub-tropical plant (*Heliconia caribaea*). *Caribbean Journal of Science* 41:243-249.

66. Bowman, W.P., M.M. Barbour, M.H. Turnbull, D.T. Tissue, D. Whitehead and K.L. Griffin. 2005. Sap flow rates and sapwood density are critical factors in within- and between-tree variation in CO2 efflux from stems of mature *Dacrydium cupressinum* trees. *New Phytologist* 167:815-828.

67. van Gestel, N.C., A.D. Nesbit, E.P. Gordon, C. Green, P.W. Pare, L. Thompson, E.B. Peffley and D.T. Tissue. 2005. Continuous light may induce photosynthetic down-regulation in onion – consequences for growth and biomass partitioning. *Physiologia Plantarum* 125:235-246.

68. Walcroft, A., K.J. Brown, W.S.F. Schuster, D.T. Tissue, M.H. Turnbull, K.L. Griffin, and D. Whitehead. Radiative transfer and carbon assimilation in relation to canopy architecture, foliage area distribution and clumping in a mature temperate rainforest canopy in New Zealand. *Agricultural and Forest Meteorology* (in press).

69. Tissue, D.T., M.M. Barbour, J. Hunt, M.H. Turnbull, K.L. Griffin, A.S. Walcroft, and D. Whitehead. Spatial and temporal scaling of intercellular CO_2 concentration in a temperate rainforest dominated by *Dacrydium cupressinum* in New Zealand. *Plant, Cell and Environment* (in press).

70. Barbour, M.M., L.A. Cernusak, D. Whitehead, K.L. Griffin, M.H. Turnbull, D.T. Tissue and G..D. Farquhar. Nocturnal stomatal conductance and implications for modelling $\delta^{18}O$ of leaf-respired CO_2 in temperate tree species. *Functional Plant Biology* (in press).

Publications in Review

1. Kornyeyev, D., B.A. Logan, D.T. Tissue and A.S. Holaday. Compensation for photosystem II photoinactivation by regulated non-photochemical dissipation influences the impact of photoinhibition on electron transport and CO_2 assimilation. *Physiologia Plantarum* (in review).

2. Reblin, J.S., B.A. Logan and D.T. Tissue. Impact of eastern dwarf mistletoe (*Arceuthobium pusillum*) infection on the needles of red (*Picea rubens*) and white spruce (*P. glauca*): oxygen exchange, biochemistry and morphology. *Tree Physiology* (in review).

Manuscripts in Preparation

1. Tissue, D.T., J.D. Lewis and J. Ward. Phosphorus supply directly and indirectly affects photosynthetic and growth responses of cottonwood seedlings to sub-ambient and elevated carbon dioxide. *Oecologia*

2. Tissue, D.T., K.L. Griffin, M.H. Turnbull and D. Whitehead. Impact of leaf and tree age on stomatal and transfer conductance limitations to photosynthesis in mountain beech (*Nothofagus solandrii* var. *cliffortiodes*).

3. Tissue, D.T., L.U. Kohorn, C.W. Cook, J. Pippen, R.B. Thomas and B.R. Strain. Ecosystem carbon flux under carbon dioxide enrichment in an old field colonized by loblolly pine.

4. Tissue, D.T., I. Ibanez, S.J. Hastings and W.C. Oechel. Photosynthetic acclimation in a semi-arid Mediterranean-type shrubland ecosystem exposed to elevated CO_2.

5. Barbour, M., J. Hunt, S. Richardson, D. Peltzer, A. Brailsford, K.L. Griffin, D.T. Tissue, M.H. Turnbull and D. Whitehead. Ecosystem functional development during forest progression and retrogression: Isotopic evidence from a temperate rainforest chronosequence.

6. Barbour, M., J. Hunt, M.H. Turnbull, K.L. Griffin, D.T. Tissue, S. Richardson, D. Peltzer and D. Whitehead. Foliar ^{15}N records closure of the N cycle along a temperate rainforest soil chronosequence.

7. van Gestel, N.C., E. Gordon, L.D. Patrick, P. Payton, E.B. Peffley and D.T. Tissue. Effect of elevated CO_2 on growth and photosynthesis of *Allium fistulosum*.

8. Smith, S.D., D.T. Tissue, M.L. Loik and T.E. Huxman. Photosynthetic responses of desert plants to elevated CO_2. Book chapter in honor of Park Nobel.

9. Griffin, K.L., D.T. Tissue, M.H. Turnbull and D. Whitehead. The effect of mitochondrial respiration during photosynthesis on the carbon gain of a native New Zealand Podocarp forest. *Tree Physiology*

10. Schuster, W.S.F., K.L. Griffin, K.J. Brown, M.H. Turnbull, D. Whitehead and D.T. Tissue. Changes in tree biomass and carbon content over seven decades (1930-2000) in an aggrading deciduous forest. *Canadian Journal of Forest Research.*

11. Griffin, K.L., M.H. Turnbull, D.T. Tissue and D. Whitehead. Age-related impacts on tree growth.

12. Turnbull, M.H., D.T. Tissue, D. Whitehead, W.S.F. Schuster and K.L. Griffin. Temperature effects on canopy respiration – implications for predicting forest carbon exchange.

Invited Speaker Presentations

1. Texas Tech University, Department of Biology. 1996.
2. McMaster University, Canada, Department of Biology. 1996.
3. University of Canterbury, New Zealand. 1997.
4. Permian Basin Petroleum Association, Midland TX. 1998.
5. Texas Tech University, Biology Matters Symposium. 1999.
6. University of Wisconsin, Milwaukee, Department of Biology. 1999.
7. Bowdoin College, Department of Biology. 2000.
8. Texas A&M University, Department of Forestry. 2000.
9. Utah State University, Crop Physiology. 2002.
10. University of California, Santa Cruz, Environmental Studies. 2003.
11. University of Texas, Austin. 2004.
12. University of Arizona, Tucson. 2004.
13. University of New South Wales, Sydney, Australia. 2004
14. USDA, Agricultural Research Services, Lubbock, Texas 2004

Presentations at Professional Meetings (last two years)

1. Gordon, E.P., N. van Gestel, T.R. Robertson, L.D. Patrick, P. Payton and D.T. Tissue. 2004. Effects of elevated CO_2 on *Allium* plants grown under controlled environmental conditions. Ecological Society of America, Annual Meeting, Portland, OR.

2. Patrick, L.D., P. Payton, S. Lambrecht, J. Zak, M. Loik and D.T. Tissue. 2004. Photosynthetic response of desert plants to a large, single precipitation event at Big Bend National Park. Ecological Society of America, Annual Meeting, Portland, OR.

3. Lewis, J.D., M. Avolio, A. Martin, K.L. Griffin and D.T. Tissue. 2004. Phosphorus and nitrogen supply interactively affect growth and photosynthesis in *Xanthium strumarium*. Ecological Society of America, Annual Meeting, Portland, OR.

4. Robertson, T.R., N. van Gestel, E.Walker, J.C. Zak, M. Loik and D.T. Tissue. 2004. Plant growth responses to simulated rainfall events for three perennial Chihuahuan Desert species of Big Bend National Park. Ecological Society of America, Annual Meeting, Portland, OR.

5. Zak, J.C., A. Nagy, D.T. Tissue and M. Loik. 2004. Impacts of precipitation changes on microbial dynamics and processes in a desert grassland. Ecological Society of America, Annual Meeting, Portland, OR.

6. van Gestel, N.C., A.D. Nesbit, E.P. Gordon, J. Nagel, L.D. Haley, E.B. Peffley and D.T. Tissue. 2004. Effect of continuous light on the physiology and biochemistry of *Allium fistulosum* and *A. cepa*. Ecological Society of America, Annual Meeting, Portland, OR.

7. Barbour, M.M., D. Whitehead, K.L. Griffin, M.H. Turnbull, D.T. Tissue and G.D. Farquhar. 2004. Nocturnal stomatal conductance and effects on the $\delta^{18}O$ of leaf-respired CO2. BASIN, International Meeting, San Francisco, CA.

8. Bell, C., H. Grizzle, J. Zak and D.T. Tissue. 2004. Microbial responses to increased precipitation in the sotol grasslands of Big Bend National Park. 6th Symposium on the Natural Resources of the Chihuahuan Desert, Alpine, Texas.

9. Tissue, D.T., T. Huxman, J. Weltzin, M. Loik, L. Patrick, T. Robertson, S. Smith and J. Zak. 2004. Assessing the response of desert ecosystems to changes in precipitation – Is there a common rain-use efficiency? 6th Symposium on the Natural Resources of the Chihuahuan Desert, Alpine, Texas.

10. Robertson, T.R., N. van Gestel, L. Patrick, E. Gordon, E. Walker, J. Zak, M. Loik and D. Tissue. 2004. Photosynthetic responses of desert plants to a 25% increase in seasonal precipitation in Big Bend National Park. 6th Symposium on the Natural Resources of the Chihuahuan Desert, Alpine, Texas.

11. Patrick, L., T. Robertson, P. Payton, J. Zak and D.T. Tissue. 2004. Photosynthetic responses of desert plants to a 25% increases in seasonal precipitation in Big Bend National Park. 6th Symposium on the Natural Resources of the Chihuahuan Desert, Alpine, Texas.

12. Zak, J., D. Tissue, M. Loik and J. Sirotnak. 2004. Precipitation patterns, soil microbes, and desert grasslands: impacts on climate change. 6th Symposium on the Natural Resources of the Chihuahuan Desert, Alpine, Texas.

13. Kornyeyev, D., B. Logan, R. Allen, D. Tissue and A.S. Holaday. 2004. Protecting photosynthesis at sub- and supra-optimal temperature: Does PSII or PSI constrain electron transport during recovery? USDA Southwest Consortium Symposium, Albuquerque, NM.

14. Rubino, L., J.D. Lewis, K.L. Griffin and D.T. Tissue. 2005. Nitrogen supply and leaf position, but not phosphorus supply, affect net photosynthetic rates in *Xanthium strumarium*. Ecological Society of America and International Congress of Ecology, Annual Meeting, Montreal, Quebec, Canada.

15. Patrick, L., T. Robertson, N. van Gestel and D. Tissue. 2005. Response of net ecosystem carbon and water exchange to a large winter precipitation pulse in a sotol-grassland at Big Bend National Park, Texas. Ecological Society of America and International Congress of Ecology, Annual Meeting, Montreal, Quebec, Canada. **(BEST POSTER – PHYSIOLOGICAL ECOLOGY SECTION).**

16. Robertson, T., N. van Gestel, L. Patrick, J. Zak, M. Loik and D. Tissue. 2005. Aboveground annual net primary productivity and species composition response to variation in timing and magnitude of precipitation in Big Bend National Park, Texas. Ecological Society of America and International Congress of Ecology, Annual Meeting, Montreal, Quebec, Canada.

17. Lewis, J.D., L. Rubino, K.L. Giffin and D.T. Tissue. 2005. Phosphorus and nitrogen supply affect growth but not development rates in *Xanthium strumarium*. Ecological Society of America and International Congress of Ecology, Annual Meeting, Montreal, Quebec, Canada.

18. Tissue, D.T., L. Patrick, A. Griffith, H. Alpert, D. Ignace and J. Cable. 2005. The effects of changes in timing and magnitude of precipitation on carbon and water fluxes: scaling C3, C4 and CAM plants to the ecosystem. Ecological Society of America and International Congress of Ecology, Annual Meeting, Montreal, Quebec, Canada.

19. Reblin, J.S., B.A. Logan and D.T. Tissue. 2005. Impact of eastern dwarf mistletoe infection (*Arceuthobium pusillum*) on the needles of red (*Picea rubens*) and white spruce (*P. glauca*): photosynthesis, biochemistry and morphology. Ecological Society of America and International Congress of Ecology, Annual Meeting, Montreal, Quebec, Canada.

20. Barbour, M.M., D. Whitehead, K.L. Griffin, M.H. Turnbull and D.T. Tissue. 2005. Errors associated with the measurement of nocturnal stomatal conductance. Ecological Society of America and International Congress of Ecology, Annual Meeting, Montreal, Quebec, Canada.

Graduate Students Advised

Nagarur Govindappa Srinivas - MS 2000
Johnna Sholtis - PhD 2002
Erin Walker – MS 2003
Kari Malen – MS 2004
Traesha Robertson – (PhD) 2000 to present
Lisa Patrick – (PhD) 2003 to present

Post-doctoral Fellows

Hirut Kebeda – 2001 to 2003

Jennifer Nagel –2003

Undergraduate Students

Three Howard Hughes Medical Institute Fellows plus 15 undergraduate researchers