Third-Year Assessment of Baylor University Major Strategic Proposal “Research Initiative in Terrestrial Paleoclimatology”: Faculty and Student Research Accomplishments, 2007, 2008, 2009, and 2010 (partial) calendar years

Executive Summary:
The Terrestrial Paleoclimatology Research Initiative, a fully funded MSP that currently consists of 6 Geology Faculty, has seen important growth and advancements of the initiative, which are reported in detail in what follows. Especially noteworthy for this summary are the following:

1) Graduation of three Ph.D. students (Drs. Cleveland, Kahmann-Robinson, and Shunk) and one M.S. student (Bongino).

2) Publication of eight peer-reviewed journal articles by four Ph.D. students.

3) Faculty (Driese and Nordt) having received three new NSF grants awarded in 2009, bringing the total number of NSF grants currently funded by Geology MSP faculty up to four and the number of Geology MSP faculty funded by NSF to three (Driese, Feng, Nordt). An NSF Doctoral Dissertation Improvement Grant (for Ph.D. student Steve Ahr) was also awarded in 2009.

3) Hosting a visiting sabbatical research professor for one year (Dr. Julia Sankey from Cal State-Stanislaus) and a second sabbatical research Professor (Dr. Yon Wang from Southwest University, Chongqing, Peoples Republic of China).

4) Hiring new tenure-track Assistant Professor Dr. Daniel Peppe from Yale University; although the search was conducted in 2008 he deferred the start of his appointment to August of 2009 in order to complete a post-doc at Wesleyan University. Dr. Peppe supports the MSP through addition of his new expertise research and teaching areas of Paleobotany and Paleomagnetism.

5) Having received a $250K gift from Baylor Geology alumnus Dr. Ken Carlile to support construction of the Thomas T. Goforth Paleomagnetic Laboratory to be provided for new hire Dr. Dan Peppe.

6) Receipt and setup of a new Thermo isotope-ratio mass spectrometer in B408 BSB. The laboratory setup was coordinated by Dr. Stephen I. Dworkin. This instrument will be a workhouse in generating data for the Geology MSP.

7) The GEO Department has just hired (starting in August of 2010) Dr. William C. (Bill) Hockaday from Rice University as the second of three Geology MSP tenure-track faculty positions. His specialization in organic geochemistry will enable organic matter “fingerprinting” to facilitate climate reconstructions. This position was part of the original funded Geology MSP.

8) The GEO Department has hired Dr. Ren Zhang from the University of Manitoba as a new a Ph.D.-level Instrumentation Specialist to manage the new stable isotope laboratory in B408 BSB. The position has a partial research scientist appointment so that he is also PI-eligible for writing and submitting grants. Dr. Zhang interprets paleoclimate records from speleothems (cave deposits).
DETAILED REPORT

Participating Baylor Faculty: Six current (and one new hire starting in August 2010) Baylor Geology faculty members currently conduct research in Terrestrial Paleoclimatology as part of the Baylor University Major Strategic Proposal:

Dr. Stacy C. Atchley (2007-present)
Professor (Ph.D., University of Nebraska – Lincoln). Research Interests: Petroleum Geology, Applied Sequence Stratigraphy, Paleopedologic Applications to Sequence Stratigraphy. (5% administrative load as Associate Chair of Geology, starting fall semester 2008)

Dr. Steven G. Driese (2007-present)
Professor and Chair (Ph.D., University of Wisconsin – Madison). Research Interests: Paleopedology, Clastic Sedimentology, Environmental Sedimentology. (50% administrative load as Chair of Geology, appointment through spring semester 2010)

Dr. Stephen I. Dworkin (2007-present)
Professor and Graduate Program Director (Ph.D., University of Texas – Austin). Research Interests: Sedimentary Petrology, Low Temperature Geochemistry, Geochemical Applications to Paleopedology. (10% administrative load as Graduate Program Director of Geology, starting fall semester 2007)

Dr. Zhaodong (Jordan) Feng (2007-present)
Associate Professor (Ph.D., University of Kansas). Research Interests: Geomorphology, Quaternary Paleoclimatology, GIS/RS Applications in Physical Geography.

Dr. Lee C. Nordt (2007-present)
Professor and Dean of College of Arts and Sciences (Ph.D., Texas A&M University). Research Interests: Paleoclimatology and paleoecology, soils and paleosols, and Quaternary Geology. (100% administrative load as Dean of College of Arts and Sciences, starting fall semester 2007)

Dr. Daniel J. Peppe (2009-present)
Assistant Professor (Ph.D., Yale University) Research Interests: Geochronology, paleomagnetism, magnetostratigraphy, paleobotany, plant systematics, taxonomy, paleoclimatology, paleoecology, biostratigraphy, palynology, lithostratigraphy, global change

Full curriculum vitae for the above-listed faculty are available upon request, or from our Geology Department website at: http://www.baylor.edu/Geology/ under each Faculty member’s name.

Dr. William C. Hockaday (2010-present)
Assistant Professor (Ph.D., The Ohio State University) Research Interests: Organic geochemistry, NMR-based fingerprinting of terrestrial organic matter, reconstructing fire temperatures from charcoal, carbon sequestration.
Faculty Awards:

Dr. Steven G. Driese was elected President-Elect of the Society for Sedimentary Geology (SEPM), a 3,500 member international Society based in Tulsa, OK. His term of office began in April, 2008 at the AAPG-SEPM Annual Meeting in San Antonio, TX. Driese was installed as president at the June, 2009 AAPG-SEPM Annual Meeting in Denver, CO and will step down in at the AAPG-SEPM Annual Meeting in New Orleans, LA in April 2010.

Research Staff:

Dr. Ren Zhang (2010, anticipated to start in May)
Instrumentation Specialist and Manager of Stable Isotope Laboratory (Ph.D., McMaster University)
Research Interests: Speleothem paleoclimatology; stable isotope geochemistry; fluid inclusions

Sabbatical Visiting Professor:

Dr. Yong Wang (2010-present)
Associate Professor visiting from Southwest University, Beibei, Chongqing, Peoples Republic of China.
Research Interests: Quaternary environmental magnetism; Tertiary paleomagnetism, Tertiary and Quaternary paleosols, loess deposits.

Participating Students: The following 22 Baylor Geology students conducted research in Terrestrial Paleoclimatology between the period of 2007-2010:

Completed Theses and Dissertations:


2) **Cleveland, David M.**, 2007, “Fluvial sequence stratigraphy and paleoclimate of the Upper Triassic Triassic (Norian-Rhaetian) Chinle strata, northern New Mexico”: PhD. Dissertation, 118 p. (degree granted in December, 2007) (Dr. Stacy C. Atchley and Dr. Lee C. Nordt, Co-Directors)


4) **Shunk, Aaron J.**, 2009, “Late Tertiary paleoclimate and stratigraphy of the Gray Fossil Site (eastern TN) and the Pipe Creek Sinkhole (north-central IN)”: Ph.D. dissertation, 98 p. (degree granted in May, 2009) (Dr. Steven G. Driese, Director)
Paleoclimatology Graduate Student Theses – Currently in Progress

1) Ahr, Steven W., “Geomorphic and pedologic assessment of a Texas Alfisol climosequence and implications for archaeological interpretation”: Ph.D. Dissertation, Dr. Lee C. Nordt, Director

2) Jennings, Debra S., “Differentiating paleoclimate and volcanogenic signatures of the Morrison Formation depositional basin, USA”: Ph.D. Dissertation, Dr. Steven G. Driese, Director.


4) Michel, Lauren A., “Field, Micromorphologic and Stable Isotopic Comparative Study of Modern and Ancient Soils from Riesel, Texas and Rusinga Island, Kenya”: Ph.D. Dissertation, Dr. Steven G. Driese and Dr. Daniel J. Peppe, Co-Directors.

5) Mintz, Jason S., “Global implications for the rise of the Givetian (375 Ma) forests, Manorkill Formation, Catskill State Park, New York, USA”: Ph.D. Dissertation, Dr. Steven G. Driese, Director.

6) Stinchcomb, Gary E., “Soil geomorphology of the Delaware River Valley, Mid-Atlantic, USA: Implications for millennial-scale climate change during the Holocene”: Ph.D. Dissertation, Dr. Steven G. Driese and Dr. Lee C. Nordt, Co-Directors.

7) Trendell, Aislyn M., “Sequence stratigraphy and paleopedology of the Sonsela Member of the Chinle Formation within the Blue Mesa area of Petrified Forest National Park: implications to production-scale reservoir heterogeneity and paleolandscape reconstruction”: Ph.D. Dissertation, Dr. Stacy C. Atchley and Dr. Lee C. Nordt, Co-Directors.

8) Sipahioglu, Sara, “Interpreting the record: High-resolution study of Holocene climate change in arid central Asia through ostracode geochemistry and assemblage data”: Ph.D. Dissertation, Dr. Zhaodong (Jordan) Feng, and Dr. Stephen I. Dworkin, Co-Directors.

9) Van Plantinga, Alex, M.S. Thesis, Pleistocene paleosols and paleolandscescapes, Rusinga Island, Kenya: Dr. Daniel Peppe, Director.

Paleoclimatology Undergraduate Senior Theses – Completed

1) Dixon, Alex, 2008, “Provenance and the early diagenetic alteration of volcaniclastic material incorporated in fluvial channel sandstone deposits, Morrison Fm. near Capitol Reef National Park, Utah”: B.S. Senior Thesis, directed by Dr. Steven G. Driese.


6) Wright, Colby, 2009, “Quantification of pedogenic clay in Middle Devonian Catskill paleosols and estimation of relative soil ages”: B.S. Senior Thesis, directed by Dr. Steven G. Driese.

Paleoclimatology Undergraduate Senior Theses – Currently in Progress


2) Landers, Tyler, 2010, “Implications of Medieval Warm Period-Little Ice Age climate change and pre-settlement human influence on Late Holocene channel deposition and erosion in Williams Creek floodplain, Axtell, TX”: B.S. Senior Thesis, directed by Dr. Steven G. Driese.

3) Torsch, Will, 2010, Organic C content of late Quaternary paleosols at Owl Creek, Coryell County, TX: B.S. Senior Thesis, directed by Dr. Stephen I. Dworkin.

Baylor Paleoclimatology Faculty Publications (underline = Baylor MSP Geology Faculty) (* = peer-reviewed journal article) (S=Baylor Paleoclimatology Ph.D.-student first-authored publication)

2010 (published, accepted or in press)


*(9) Wang, W., Ma, Y.Z., and Feng, Z.-D., accepted, A prolonged dry mid-Holocene climate revealed by pollen and diatom data from Uigi Nuur lake core in central Mongolia: *Quaternary International*.


**2009**


**2008**


2007


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**Faculty and Student Professional Presentations (underline = Baylor MSP Geology Faculty) (S=Baylor Paleoclimatology Ph.D.-student first-authored publication)**

2010 (not reported)

2009


S (11) Mintz, J.M. (with S.G. Driese, W. Miller, and J. Wiedenfeld as co-authors), 2009, “Micromorphologic assessment of pedogenesis in hydromorphic vertisols from bottomland hardwood forests, Old Ocean, Brazoria County, Texas, USA”: (talk presented at 46th Annual Soil Survey and Land Resource Workshop in College Station, TX, February 5, 2009).

S (12) Mintz, J.S., Driese, S.G., and White, J.D., 2009, Environmental and ecological variability of Middle Devonian (Givetian) forested paleosols in the Catskill region, Appalachian basin, New York: presented at Northeastern section GSA meeting in Portland, ME.

(14) **Peppe, D.J.**, Royer, D.L., Oliver, S., 2009, Digital Leaf Physiognomy: Using Leaf Size and Shape to Reconstruct Early and Middle Paleocene Climate Change in the Western Interior of North America: Eos Transactions AGU, PP11F-06.


2008


(2) **Driese, S.G.**, 2008, “Micromorphology of floodplain soils at the Buttermilk Creek Archaeological Site near Salado, Bell County, Texas”: (talk presented at 45th Annual Soil Survey and Land Resource Workshop in College Station, TX, February 7, 2008).
(3) **Driese, S.G.**, 2008, “Applications of soil micromorphology, pedology and geochemistry to interpreting a possible pre-Clovis (13-17 kyr) archaeological site at Buttermilk Creek, Bell County, Texas”: (talk presented as 16th Kansas Geological Survey Stratigraphic Research Seminar in Lawrence, KS, November 11, 2008).


S (9) Shunk, A.J., **Driese, S.G.**, 2008, Multiple proxy evidence from paleosols for abrupt Late Neogene warming at the Gray Fossil site, northeastern TN, USA: joint GSA-SSSA National Meeting in Houston, TX.


**2007**


S (2) Dixon, A.H., **Driese, S.G.**, and Jennings, D.S., 2007, Provenance and the early diagenetic alteration of volcaniclastic material incorporated in fluvial channel sandstone deposits, Morrison Fm. near Capitol Reef National Park, Utah: GSA Annual Meeting in Denver, CO.

(3) **Driese, S.G.**, Multi-proxy approaches to interpreting time in the geologic record using soils: (talk presented at 44th Annual Soil Survey and Land Resource Workshop in College Station, TX, February 1, 2007).


Grants SUBMITTED and AWARDED (underline = Baylor Geology Faculty)

2009
(1) **Driese, S.G.,** and **Nordt, L.C.,** 2009, with the University of Texas-Austin as the lead institution (with D.O. Breecker as PI/PD), Collaborative research: Calibrating the paleosol carbonate CO$_2$ paleobarometer for vertic paleosols by monitoring soil CO$_2$ in modern Vertisols: NSF Geobiology and Low-Temperature Geochemistry program (Note: Baylor University share of grant for three years is $94,395, commencing August 15, 2009).


(3) **Nordt, L.C.,** and **Ahr, S.,** 2009, Doctoral dissertation improvement grant: “Determining the age and the origin of the Texas Sandy Mantle: Implications for archaeological integrity in upland settings”: NSF BCS-Archaeology program ($14,999) (04/01/09 to 03/30/10).

(4) **Driese, S.G.,** 2009, with the University of Tennessee-Knoxville as the lead institution (with Z.-H. Li as PI/PD, and S.P. Horn as co-PIs), Collaborative research: Pleistocene-Holocene climate variability of the southern Appalachian region, southeastern U.S.: NSF Paleo-Perspectives on Climate Change (P2C2) program ($61,057 requested for three years, commencing October 1, 2009).

**2008**

(1) **Peppe, D.J.,** 2008, with University of Minnesota as the lead institution (K. McNulty as lead PI, and Dunsworth, H. as co-PI) and the American Museum of Natural History (W. Hartcourt-Smith and I. Tattersol), Collaborative research: Paleobiology of Early Miocene primates from Rusinga and Mfangano Islands, Kenya, awarded by NSF-BCS, $219,415 awarded for 3 years (Note: Although a project director and major contributor to the proposal, Dr. Peppe is only listed on a sub-contract on this proposal through the University of Minnesota because this proposal was submitted after Peppe was hired by Baylor but prior to beginning his the position. The sub-contract is for $9933 for three years commencing June 2009).

**2007**


(2) **Driese, S.G.,** 2007-2010, Co-PI with 4 University of Kansas (KU) Geology faculty members (Ludvigsen, G., Fowle, D.A., González, L.A., and Roberts, J.A., KU as lead institution), Collaborative Research: Actualistic calibration of the sphaerosiderite paleoclimate proxy: National Science Foundation, Geobiology and Low-temperature Geochemistry program ($118,967 awarded to Baylor University for three years, commencing June 1, 2007).

(3) **Dworkin, S.I.,** 2007-2008, University Research Council (URC) grant, $3,000.

(4) **Feng, Z.-D.,** 2006-2009, (Lead PI): Collaborative research (with Dr. K.-B Liu at LSU): Bioclimatic reconstruction of the past 50,000 years from eolian sequences in the westerlies-dominated Central Asia: National Science Foundation, Geography and Regional Sciences Program, (Feng’s portion = $150,000).

(5) **Feng, Z.-D.,** 2007, Summer Faculty Research Incentive Program (FRIP) grant from Office of the Vice Provost for Research as ‘seed” money to develop a new NSF grant for research in Kazakhstan, $25,000.

**Grants SUBMITTED and either not awarded, or pending (underline = Baylor Geology Faculty)**
2010

(1) **Feng, Z.-D.**, Liu, K.-B. (at LSU) and Lu, H. (at Chinese Academy of Sciences), 2010, Collaborative Research: Reconstruction of Mid-Holocene bioclimatic changes in the Central Plain of China and their cultural implications: submitted to NSF Geography and Spatial Sciences Program, $151,844 requested, awarded from 07-01-10 to 06-30-12. PENDING.

2009

(1) **Driese, S.G.**, 2009, with the University of Tennessee-Knoxville as the lead institution (with Z.-H. Li as PI/PD, and S.P. Horn and D.M. Finklestein as co-PIs), Collaborative research: Multiproxy expression of the mid-Holocene Warm Period in the southern Appalachian region, southeastern U.S.: submitted to NSF Geography and Spatial Sciences program (Note: Baylor University share of grant would be $66,288 requested for three years, commencing August 1, 2009). NOT FUNDED.

(2) **Driese, S.G.**, Bradley, W.L., Lau, B.L.T., Rushing, A., and Skurla, C., 2009, MRI-R2: Acquisition of an environmental SEM for Baylor University: submitted to NSF MRI-R2 program, grant is for one year totaling $576,620, awarded from 06-01-10 to 05-31-11. NOT FUNDED.

(3) **Feng, Z.-D., and Dworkin, S.I., 2009**, High-resolution Reconstruction of Holocene Bioclimatic Changes in the core area of the Central Asian Arid Zone: submitted to NSF Paleo-Perspectives on Climate Change (P2C2) Program, $412,129 requested, awarded from 07-01-10 to 06-30-13. PENDING.

(4) Park, K., Zhang, Goodman, **Driese, S.G.**, and Lau, B.L.T., 2009, MRI-R2: Acquisition of high-pressure X-ray photoelectron spectroscopy: submitted to NSF MRI-R2 program, grant is for one year totaling $785,351, awarded from 02-01-10 to 01-31-11. PENDING.

(5) **Peppe, D.J.**, 2009, with the New Mexico Museum of Natural History as the lead institution (with T. Williamson) and the University of Nebraska-Lincoln (with R. Secord), Collaborative research: The First Four Million Years of the Age of Mammals in the San Juan Basin, New Mexico: Examining Early Paleocene Climate Change and the Mammalian Radiation, submitted to the NSF-EAR program, $684,553 requested for three years from 06/01/09 – 05/31/12 (Note: Baylor University’s share of the grant would be $320,395 for three years commencing in June 2009). NOT FUNDED.

(6) **Peppe, D.J.**, 2009, with New York University as the lead institution (with C.A. Tryon as the PI) and in collaboration with the University of Minnesota (D.L. Fox), Collaborative research: Quaternary Archaeology and Environments of Rusinga and Mfangano Islands, Kenya, submitted to NSF-BCS program, $180,082 requested for two years from 06-01-10 to 05-31-12 (Note: Baylor University’s share of grant would be $67,138 for three years commencing June 2010). PENDING.

2008

(1) **Driese, S.G., and Atchley, S.C., 2008**, Global implications for the rise of the Givetian (375 Ma) forests, Manorkill Formation, Catskill State Park, New York, USA: submitted to NSF Paleo Perspectives on Climate Change (P2C2) program ($225,865 requested for three years, commencing July 1, 2008). NOT FUNDED.

(2) **Feng, Z.-D., 2008**, Collaborative Research: Reconstructing the temporal and spatial patterns of MIS 3 bioclimatic changes from eolian and lacustrine sequences in the Chinese Loess Plateau: submitted to NSF
Sedimentary Geology and Paleobiology program ($185,750, requested for 07/01/08 to 06/30/10). NOT FUNDED.

(3) **Feng, Z.-D.**, 2008, Collaborative Research: Mid-Holocene bioclimatic changes in the Central Plain of China and their cultural implications: NSF Geography and Regional Science ($254,270 requested for 07/01/08 to 06/30/11). NOT FUNDED.

(4) **Feng, Z.-D.**, 2008, High-resolution reconstruction of Holocene bioclimatic changes in Central Asian arid zone: NSF Paleo-Perspectives on Climate Change (P2C2) program ($507,428 requested for 07/01/08 to 06/30/11). NOT FUNDED.

(5) **Nordt, L.C.**, 2008, Development of a new dating technique for alluvial deposits containing archaeological materials: a case study from the Fort Hood Military Reservation, Texas, U.S. Department of Defense. (submitted in December, 2008; Total amount requested is $54,000). NOT FUNDED.

**2007**

(1) **Driese, S.G.**, 2007, with Baylor University as the lead institution and S.P. Horn from the University of Tennessee as co-PI, Collaborative research: Differentiating paleoclimate and volcanogenic signatures in the Morrison Formation depositional basin, USA: submitted to NSF Sedimentary Geology and Paleobiology program ($185,659 requested for two years, commencing June 1, 2007). NOT FUNDED.

(2) **Driese, S.G.**, 2007, with the University of Tennessee-Knoxville as the lead institution (with Z.-H. Li as PI/PD, and C.I. Mora and S.P. Horn as co-PIs), Collaborative research: Pleistocene-Holocene climate variability of the southern Appalachian region, southeastern U.S.: submitted to NSF Sedimentary Geology and Paleobiology program ($56,794 requested for three years, commencing June 1, 2008). NOT FUNDED.

(3) **Dworkin, S.I.,** Doyle, R., **Feng, Z.,** **Driese, S.G.,** and King, R.S., 2008, MRI: Acquisition of a stable isotope mass spectrometer for paleoclimate and ecology research and training: submitted to NSF Major Research Instrumentation (MRI) program ($342,185 for one year, commencing July 1, 2007). NOT FUNDED.

(4) **Nordt, L.C.**, 2007, Late Pleistocene adaptations and behavioral transformations in the South African Highveld Grassland. Co-Principal investigators Britt Bousman and David Brink; L. Nordt is a paid collaborator. NOT FUNDED.