

SUSAN T. GOLDSTEIN
PROFESSOR, DEPARTMENTS OF GEOLOGY AND MARINE SCIENCES
CURRICULUM VITAE

Address:

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Education:

Ph.D.; University of California, Berkeley; 1984, (Paleontology)
“Biology of a Saccammina (Foraminifera) from San Francisco Bay”
Major Professor: Zach M. Arnold (emeritus)
M.S.; University of Florida; 1976, (Geology)
“The Distribution and Ecology of Benthic Foraminifera in a South Florida Mangrove Environment”
Major Professor: David Nicol (deceased)
B.S.; Bowling Green State University; 1974, (Geology and Biology)

Employment and Positions:

Fall, 2009: Guest Investigator, Woods Hole Oceanographic Institution; Woods Hole, MA
2000 - 2006: Head, Department of Geology, Univ. of Georgia; served 2 3-year terms.
1999 - present: Professor, Geology and Marine Sciences; Univ. of Georgia
1992 - 1999: Associate Professor, Geology and Marine Sciences; Univ. of Georgia
1990 - 1992: Associate Professor (with tenure), Geology, Univ. of Georgia
1984 - 1990: Assistant Professor, Geology, University of Georgia

Honors and Awards:

Member: Board of Directors, Cushman Foundation for Foraminiferal Research; 1999 – present
President Cushman Foundation for Foraminiferal Research, 2007-2008; 2012-2013.
Marine Ecology Progress Series: Featured Article, vol. 437, September, 2011.
Diatome Awards:, Second Place (1998), Third Place (2006, 2011); presented at the Microscopy &
Microanalysis Annual Meetings.
U.S. Antarctic Service Medal, 2001.
W. Storrs Cole Memorial Research Award (Geological Society of America); 1998.
General Sandy Beaver Teaching Award (Franklin College of Arts and Sciences, Feb. 15, 1988.
Teacher of the Year, Department of Geology, University of Georgia (voted by geology
undergraduates), Spring, 1987.

Interdisciplinary Staffings:

Marine Sciences Faculty (Co-listed); Graduate Faculty

INSTRUCTION

Courses Currently Taught at UGA:

GEOL 1122 Earth's History of Global Change
GEOL 4/6510 Marine Micropaleontology
GEOL 8130: Paleocommunities
GEOL 8060: Advanced Topics in Paleobiology
GLY GEOL 1122L: coordinate labs for Earth's History of Global Change and train TAs

Student Advising:

Ph.D.:

Deniz Altin-Ballero: "The application of the total evidence phylogenetic approach for phylogenetic reconstruction of selected allogromiid foraminifera of Sapelo Island, Georgia, USA," Completed December, 2013

M.S. Theses directed:

- Darin Lang: "Dispersal and propagule banks of benthic foraminifera: shelf to bathyal settings, western North Atlantic" – Completed December, 2013
- Ellen Brouillette: "An Experimental Approach to Understand the Responses of Benthic Foraminifera to Cd, Pb, Hg, and Zn", Department of Geology, University of Georgia, completed Summer, 2009.
- Robert M. Kuhn, "Distribution, Taphonomy and Paleoenvironmental Reliability of Salt Marsh Foraminifera, South End Marsh, St. Catherines Island, Georgia", Department of Geology, University of Georgia, completed Winter, 1994.
- G. Todd Watkins, "Southeastern U.S. Backbarrier Salt Marsh Foraminifera (St. Catherines Island, Georgia): Factors Controlling Assemblage Distribution", Department of Geology, University of Georgia, completed Fall, 1993.
- William B. Egeland, "Diversity and distribution of benthic foraminifera in the nearshore zone off the coast of Georgia and South Carolina", Department of Geology, University of Georgia, completed Spring, 1992.
- Barbara A. Murphy, "Quantitative stratigraphic distribution of Quaternary benthic foraminifera on the continental shelf off South Carolina", Department of Geology, University of Georgia, completed Spring, 1987.

Bachelors Candidates

Senior Honors Theses directed:

- Emily C. Bagwell, "Infaunal Foraminifera in a Georgia Salt Marsh", Department of Geology, University of Georgia, completed Fall, 1988
- Stephen K. Wilson, "Selective preservation of foraminifera in a Georgia salt marsh", Department of Geology, University of Georgia, completed Spring, 1986.
- Directed Research: (BIO 496H), Erica Key, Winter, 1996; Jon Judy, 2005-2006, Dylan Radford, 2010-2011, Lauren Overstreet, 2010-2011, Nicole Graham, 2010-2013, James Thompson, 2011-2012

Service on numerous other M.S. and Ph.D. Committees:

RESEARCH

Research Focus:

Research focuses on modern benthic foraminifera. Projects include foraminiferal life cycles and reproductive strategies; dispersal; test morphogenesis, especially among foraminiferal basal clades; the ecology, taphonomy, and paleoecology of salt marsh foraminifera, including applications of salt marsh foraminifera to studies on Holocene sea level change. Current research focuses on dispersal mechanisms and recruitment in benthic foraminifera, understanding foraminiferal biodiversity, and the effects of selected pollutants on foraminifera.

Professional Affiliations:

Cushman Foundation for Foraminiferal Research
Paleontological Society
Society of Protozoologists
Geological Society of America
ASLO (American Society of Limnology and Oceanography)

Grants:

- "Distribution of Foraminifera in a Georgia Salt Marsh," Faculty Research Grants, University of Georgia, 1985-86.
- "Salt Marsh Foraminifera, St. Catherines Island, Georgia: Ecology, Taphonomy, Paleoecology," S.T. Goldstein (PI) and R.W. Frey (Co-PI); National Science Foundation (Earth Sciences: Strat. Paleo.); Funded from 1/1/89 to 12/31/91.

"Taphonomic Tiering: Preservational Constraints on Micro- and Macrofauna," S.E. Walker (P.I.) and S.T. Goldstein (Co-P.I.), National Science Foundation (Geology and Paleontology Program); Funded 8/96 - 8/99.

Phylogeny and Reproductive Pattern in the Foraminifera, S.T. Goldstein, W. Storrs Cole Memorial Research Award, Administered by the Geological Society of America, 1998.

Editorial Assistant, *Journal of Foraminiferal Research*; S.T. Goldstein; Cushman Foundation for Foraminiferal Research, 1999.

Acquisition and Curation of Southeastern U.S. Fossils, S.T. Goldstein; Department of Natural Resources, Environmental Protection Division; 2001.

"Survey of Basal Foraminifera", S.S. Bowser (PI) and S.T. Goldstein (Co-PI); National Science Foundation (Division of Environmental Biology – Biodiversity Surveys and Inventories); June 1, 2005 – May 31, 2008.

"Collaborative Research: Dispersal and life history dynamics in benthic foraminifera;" S.T. Goldstein (lead PI) and J.M. Bernhard (PI); NSF Biological Oceanography; 6/15/09 – 5/31/13.

Publications -- Edited Volumes:

Goldstein, S.T. and Bernhard, J.M. (Editors), 1997, Theme Issue: Biology of Foraminifera: Applications in Paleooceanography, Paleobiology, and Environmental Sciences: *Journal of Foraminiferal Research*, 27(4).

Martin, R.E., Patterson, R.T., Goldstein, S.T., and Kumar, A. (Editors), 1999. Special Issue: Taphonomy as a Tool in Paleoenvironmental Reconstruction and Environmental Assessment: *Palaeogeography, Palaeoclimatology, Palaeoecology*, 149(1-4):vii-434.

Cedhagen, T., Goldstein, S.T., and Gooday, A.J., (Editors), 2002, Theme Issue: Biology and Biodiversity of Allogromiid Foraminifera: *Journal of Foraminiferal Research*, v. 32, no. 4, p. 331-458.

Book Chapters:

Goldstein, S.T., 1999. Foraminifera: A Biological Overview, p. 37-56, *in* B.K. Sen Gupta (Ed.) *Modern Foraminifera*; Kluwer, Dordrecht, The Netherlands.

Alve, E., and Goldstein, S.T. 2014. The propagule method as an experimental tool in foraminiferal ecology. p. 1-12, *In*: Kitazato, H., and Bernhard, J.M. (Eds.), *Experimental Approaches in Foraminifera: Collection, Maintenance and Experiments*, Springer.

Published Papers: (+ indicates a publication not refereed)

Altin-Ballero, D.Z., Habura, A., and Goldstein, S.T., 2013. *Psammophaga sapela* n. sp., a new monothalamous foraminiferan from coastal Georgia, U.S.A.: fine structure, gametogenesis, and phylogenetic placement: *Journal of Foraminiferal Research*, 43:113-126.

Goldstein, S.T., and Alve, E. 2011. Experimental assembly of foraminiferal communities from coastal propagule banks: *Marine Ecology Progress Series*, 437:1-11. [Featured Article for this issue]

Goldstein, S.T., Habura, A., Richardson, E.A., and Bowser, S.S., 2010, *Xiphophaga minuta*, and *X. allominuta*, nov. gen., nov. spp., new monothalamid Foraminifera from coastal Georgia (USA): cryptic species, gametogenesis, and an unusual form of chloroplast sequestration: *Journal of Foraminiferal Research*, 40:3-15.

- Bernhard, J.M., Goldstein, S.T., and Bowser, S.S. 2010. An ectobiont-bearing foraminiferan, *Bolivina pacifica*, that inhabits microoxic pore waters: cell-biological and paleoceanographic insights: *Environmental Microbiology*, 12(8):2107-2119.
- Alve, E., and Goldstein, S.T. 2010. Dispersal, survival and delayed growth of benthic foraminiferal propagules: *Journal of Sea Research*, 63:36-51.
- Altin, D.Z., Habura, A., Goldstein, S.T. 2009. A new allogromiid foraminifer *Niveus flexilis* nov. gen., nov. sp., from coastal Georgia, USA: fine structure and gametogenesis: *Journal of Foraminiferal Research*, 39(2): 73-86.
- Habura, A., Goldstein, S.T., Broderick, S., and Bowser, S.S. 2008. A bush, not a tree: The extraordinary diversity of cold-water basal foraminiferans extends to warm-water environments: *Limnology and Oceanography*, 53(4):1339-1351.
- Habura, A., Goldstein, S.T., Parfrey, L., and Bowser, S.S., 2006. Phylogeny and ultrastructure of *Miliammina fusca*: Evidence for secondary loss of calcification in a miliolid foraminifer: *Journal of Eukaryotic Microbiology*, 53(3):204-210.
- +Goldstein, S.T., Arnold, A.J., and McLaughlin, P.P., Jr., 2006, The Joseph A. Cushman Award to Barun K. Sen Gupta: *Journal of Foraminiferal Research*, 36(1):1-2.
- Alve, E. and Goldstein, S.T. 2003. Propagule transport as a key method of dispersal in benthic Foraminifera (Protista): *Limnology and Oceanography*, 48:2163-2170.
- Goldstein, S.T. and Richardson, E.A. 2002. Comparison of test and cell body ultrastructure in three modern allogromiid foraminifera: Application of high pressure freezing and freeze substitution: *Journal of Foraminiferal Research*, 32:375-383.
- Alve, E. and Goldstein, S.T. 2002. Resting stage in benthic foraminiferal propagules: a key feature for dispersal? Evidence from two shallow water species: *Journal of Micropaleontology*, 21:95-96.
- + Goldstein, S.T. 2002. (book review) *Monitoring in Coastal Environments Using Foraminifera and Thecamoebian Indicators*. *Quarterly Review of Biology*, 77:226.
- Goldstein, S.T., and Watkins, G.T. 1999. Taphonomy of salt-marsh foraminifera: An example from coastal Georgia: *Palaeogeography, Palaeoclimatology, Palaeoecology*, 149(1-4):103-114.
- Walker, S.E., and Goldstein, S.T. 1999. Experimental field taphonomy: Taphonomic tiering of molluscs and foraminifera above and below the sediment-water interface: *Palaeogeography, Palaeoclimatology, Palaeoecology*, 149(1-4):227-244.
- + Martin, R.E., Goldstein, S.T., and Patterson, R.T., 1999, Taphonomy as an environmental science: *Palaeogeography, Palaeoclimatology, Palaeoecology*, 149(1-4):vii-viii.
- Goldstein, S.T. and Watkins, G.T. 1998. Elevation and the distribution of salt-marsh foraminifera, St. Catherines Island, Georgia: A taphonomic approach: *Palaeo*, 12(6):570-580.
- Goldstein, S.T. 1997. Gametogenesis and the antiquity of reproductive pattern in the Foraminifera: *Journal of Foraminiferal Research*, 27:319-328.
- + Goldstein, S.T. and Bernhard, J.M. 1997. A theme issue on biology of the Foraminifera: applications in paleoceanography, paleobiology, and the environmental sciences: *Journal of Foraminiferal Research*, 27:253.

Goldstein, S.T., Watkins, G.T., and Kuhn, R.M. 1995. Microhabitats of salt marsh foraminifera: St. Catherines Island, Georgia: *Marine Micropaleontology*, 26(1-4):7-30.

Goldstein, S.T. and Corliss, B.H. 1994. Deposit feeding in selected deep-sea and shallow-water benthic foraminifera: *Deep Sea Research*, 41:229-241.

Goldstein, S.T. and Moodley, L. 1993. Gametogenesis and the life cycle of the foraminifer Ammonia beccarii (Linné) forma tepida (Cushman): *Journal of Foraminiferal Research*, 23:213-220.

Goldstein, S.T. and Harben, E.B. 1993. Taphofacies implications of infaunal foraminiferal assemblages in a Georgia salt marsh, Sapelo Island: *Micropaleontology*, 39:53-62.

Goldstein, S.T. and Barker, W.W., 1990, Gametogenesis in the monothalamous agglutinated foraminifer Cribrorhammina alba: *Journal of Protozoology*, 37:20-27.

Goldstein, S. T., 1988b, Foraminifera of relict salt marsh deposits, St. Catherines Island, Georgia: taphonomic implications: *PALAIOS*, 3:327-334.

Goldstein, S. T., 1988a, On the life cycle of Saccamina alba Hedley: *Journal of Foraminiferal Research*, 18:311-325.

Goldstein, S. T. and Barker, W. W., 1988, Test ultrastructure and taphonomy of the monothalamous agglutinated foraminifer Cribrorhammina n. gen. alba (Heron-Allen and Earland): *Journal of Foraminiferal Research*, 18:130-136.

Goldstein, S. T. and Frey, R. W., 1986, Salt marsh foraminifera, Sapelo Island, Georgia: *Senckenbergiana maritima*, 18:97-121.

Gregg, J., Goldstein, S. T. and Walters, L. J., 1978, Occurrence of strained quartz in the siliceous frustules of cultured fresh-water diatoms: *Journal of Sedimentary Petrology*, 47:1623-1629.

Theme Sessions & Symposia Chaired / Co-Chaired:

Invasions, Dispersal and Biogeographic Range Expansions of Foraminifera: Lessons from Earth History; International Symposium on Foraminifera, 2014, Concepcion, Chile; Chairs: Martin R. Langer, Anna E. Weinmann, Susan T. Goldstein.

Conservation Paleobiology – The Microfossil Record; Susan T. Goldstein and Jere Lipps, Chairs; Geological Society of America, Annual Meeting (Denver, CO), 2013

Frontiers in Foraminiferal Research : Biology/Ecology/Paleoecology; Pamela Hallock and Susan Goldstein; Geological Society of America, Annual Meeting (Minneapolis, Minnesota). 2011

Biogeography of Foraminifera; International Symposium on Foraminifera, 2010; Bonn, Germany; (Chairs: M. Langer and S.T. Goldstein)

Systematics and Evolution of Protists: Fossils, Morphology and Molecules; International Symposium on Foraminifera, 2006; Natal Brazil; (Chairs: J. Lipps and S.T. Goldstein)

Protistan Paleobiodiversity: Understanding Evolutionary Patterns (Cushman Foundation); Geological Society of America Annual Meeting, 2004. (Chairs: S.T. Goldstein and B. Huber)

Biology of the Foraminiferida: Applications in Paleoceanography, Paleobiology, and the Environmental Sciences, Cushman Foundation; Geological Society of America Annual Meeting, 1996. (Chairs: S.T. Goldstein and J.M. Bernhard)

Taxonomy of Microfossils: Paleoenvironmental Reconstruction and Environmental Assessment, Cushman Foundation; Geological Society of America Annual Meeting, 1995. (Chairs: R.E. Martin and S.T. Goldstein)

Local, Regional, and Global Change: Microfauna as Tools, Cushman Foundation; Linked Earth Systems: 1st SEPM Congress on Sedimentary Geology, 1995. (Chairs: D.B. Scott and S.T. Goldstein)

Workshop Presentations (Invited):

Workshop on the Biology of the Foraminifera (July 27-30, 1997), Lizard Island Marine Station (Northern Great Barrier Reef, Australia -- in conjunction with the 10th International Congress of Protozoology)

- 1) Ultrastructural Methods for Foraminifera (with Sam Bowser)
- 2) Life Cycles of the Foraminifera (with John Lee and Jan Pawlowski)

“Standardisation of methods in foraminiferal studies”, presented with J.-P. Debenay, (Feb., 2002); Forams 2002 – International Symposium on Foraminifera, Perth, Western Australia.

“Allogromiid Foraminifera”, presented with S.S. Bowser; International Symposium on Foraminifera, 2006, Natal Brazil

Abstracts since 2010 (=invited papers)**

** Goldstein, S.T. 2014. Morphology, molecules, and the monothalamous Foraminifera: Overview of works in progress: International Symposium on Foraminifera: Forams 2014; Chile, 19-24, 2014, Abstract Volume, p. 1; published by the Grzybowski Foundation. [Keynote Talk]

Goldstein, S.T., Edgcomb, V.P., Lang, D. and Bernhard, J.M. 2014. Dispersal of benthic foraminifera in the western north Atlantic: Pattern, processes, and population dynamics: International Symposium on Foraminifera: Forams 2014; Chile, 19-24, 2014, Abstract Volume, p. 45-46; published by the Grzybowski Foundation.

Lang, D.M., Bernhard, J.M., and Goldstein, S.T., 2013. Dispersal and the growth of allochthonous benthic foraminifera in shelf to bathyal settings, western North Atlantic: Geological Society of America, Annual Meeting (Denver, CO), Abstracts with Programs, 45(7):323.

Ballero, D.Z.A., Habura, A., and Goldstein, S.T., 2013. In or out? Application of a multi-gene analysis testing the fidelity of the morphologically diverse clade E allogromiid foraminifera: Geological Society of America, Annual Meeting (Denver, CO), Abstracts with Programs, 45(7):474.

Goldstein, S.T., Edgcomb, V.P., Lang, D.M., Bernhard, J.M., 2013. Warming oceans and potential range expansion of “smaller” benthic foraminifera: insights from propagule experiments: Geological Society of America, Annual Meeting (Denver, CO), Abstracts with Programs, 45(7):532.

Platsky, A. L.-A., Sclafani, J. A., and Goldstein, S.T., 2012, The effect of increased salinity on foraminiferal assemblages in Georgia salt marshes: Southeastern GSA Section Meeting, Asheville, NC, Abstracts with Programs, 44(4):18.

Lang, D.M., Graham, L.N., Thompson, J., Bernhard, J.M., and Goldstein, S.T. 2012, Dispersal and propagule banks of benthic foraminifera: shelf to bathyal settings, western North Atlantic: Geological Society of America Annual Meeting & Exposition, Abstracts with Programs, 44(7):86.

Ballero, D.Z., Habura, A., Schroeder, P.A., and Goldstein, S.T., 2012, Fine structure, reproduction and

phylogenetic placement of a species of *Psammophaga* (Foraminifera) from coastal Georgia, USA: Geological Society of America Annual Meeting & Exposition, Abstracts with Programs, 44(7):90.

** Goldstein, S.T., Alve, E., and Bernhard, J.M., 2012, The propagule bank as an experimental tool in foraminiferal ecology: Geological Society of America Annual Meeting & Exposition, Abstracts with Programs, 44(7):523.

Goldstein, S.T., Edgcomb, V.P., and Bernhard, J.M., 2011. Propagules of benthic foraminifera and the offshore dispersal of modern shallow-water taxa: Geological Society of America, Annual Meeting (Minneapolis, Minnesota), Abstracts with Program:43(5):555.

Lipps, J.H., and Goldstein, S.T., 2011. Life history and dispersal in foraminifera: Geological Society of America, Annual Meeting (Minneapolis, Minnesota), Abstracts with Program:43(5):555.

Radford, D.T., Overstreet, L.D., Bernhard, J.M., and Goldstein, S.T., 2011. Experimentally grown foraminiferal assemblages from the “mud patch” continental shelf site (Cape Cod, USA): the roles of temperature and diet: Geological Society of America, Annual Meeting (Minneapolis, Minnesota), Abstracts with Program:43(5):596.

Goldstein, S.T., Bowser, S.S., and Richardson, E.A., 2011. Toward understanding the biodiversity of gromiids: the fine structure of *Gromia* sp. from Zane Grey Creek, Florida Keys: Microscopy and Microanalysis, 17(Suppl. 2):348.

** Goldstein, S.T., Alve, E., and Bernhard, J.M. 2011. Applications of the foraminiferal propagule bank: a novel approach to understanding the ecology of foraminifera: Geological Society of America, Southeastern Section, 42(2):71.

Overstreet, L.D., Radford, D.T., Bernhard, J.M., and Goldstein, S.T. 2011. A comparison of *in situ* and experimentally grown foraminiferal assemblages from the “mud patch” continental shelf site (Cape Cod, USA): the role of temperature: Geological Society of America, Southeastern Section, 42(2):4.

Goldstein, S.T., Bernhard, J.M., and Edgcomb, V.P., 2010. Propagule dispersal in benthic foraminifera: biogeography and the occurrence of “exotic” taxa: Geological Society of America Annual Meeting, Abstracts with Program, 42(5):374.

** Goldstein, S.T. 2010. On the ecology and evolution of the foraminiferal life cycle: ISOP (International Society of Protozoologists), Canterbury, UK, July 18-23, 2010, Abstracts, p. 32 (plenary talk)

Goldstein, S.T., Bernhard, J.M., and Edgcomb, V.P., 2010. Propagule dispersal in benthic foraminifera and the occurrence of “exotic” taxa: Forams 2010 - International Symposium on Foraminifera, Bonn; Abstracts Volume with Program, p. 96.

Goldstein, S.T., 2010. Foraminiferal ectobionts and the occurrence of aberrant test morphologies: Forams 2010 - International Symposium on Foraminifera, Bonn; Abstracts Volume with Program, p. 96.

Altin-Ballero, D.Z., Habura, A., and Goldstein, S.T., 2010. Phylogeny reconstruction of selected Clade E allogromiid foraminifera using multiple genetic markers: Forams 2010 - International Symposium on Foraminifera, Bonn; Abstracts Volume with Program, p. 46.

Bowser, S.S., Loncarek, J., Goldstein, S.T., and Travis, J.L., 2010. Pseudopodia of *Gromia* and *Allogromia*: sister organelles or long (long) lost cousins?: Forams 2010 - International Symposium on Foraminifera, Bonn; Abstracts Volume with Program, p. 62.

Goldstein, S.T., and Bernhard, J.M., 2010. Dispersal in benthic Foraminifera and dynamics of the “propagule bank,” Benthic Ecology Meeting 2010, Wilmington, NC, Abstracts, p. 73.

SERVICE

Service has included participation on numerous departmental and university committees, the faculty senate, and graduate and university councils at the University of Georgia as well as service to professional organizations, particularly the Cushman Foundation for Foraminiferal Research (Member, Board of Directors since 1999) and the Paleontological Society. In addition, I served as Editor for the *Journal of Foraminiferal Research* (3-yr term September, 1997 - September, 2000).