

Christopher S. Brown

Associate Vice Chancellor for Research Development
Professor of Plant Biology
Director of the North Carolina Space Grant
North Carolina State University

Contact Information

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Education

Food for the 21st Century Postdoctoral Fellow, Biochemistry, 1987-1989, University of Missouri, Columbia, MO
Doctor of Philosophy in Botany, 1987, North Carolina State University, Raleigh, NC
Master of Science in Horticulture, 1984, North Carolina State University, Raleigh, NC
Bachelor of Science in Botany, 1981, University of North Carolina at Chapel Hill, NC

Professional Experience

Associate Vice Chancellor for Research Development, North Carolina State University (NCSU) 2008 - present
Director of the North Carolina Space Grant, NCSU, 2006-present
Professor of Plant Biology, NCSU, 2007-present
Associate Member of the Faculty, Mechanical and Aerospace Engineering, NCSU, 2006-present
Assistant Vice Chancellor for Research, NCSU, 2006-2008
Research Professor of Plant Biology, NCSU, 2005-2007
Research Associate Professor of Botany, NCSU, 2004-2005
Visiting Associate Professor of Botany, NCSU, 2001-2004
Adjunct Associate Professor of Botany, NCSU, 1997-2001
Director of the North Carolina Space Initiative, Kenan Institute for Engineering, Technology & Science, NCSU, and UNC General Administration, 2001-2007
Director, NASA Specialized Center for Research and Training (NSCORT), NCSU, Wake Forest University, Baruch College (CUNY) and Dynamac Corporation, 1999-2006
Associate Director, NSCORT, 1996-1999
Scientist and Project Manager, Dynamac Corporation, Durham, NC, 1996-2001
Senior Manager/Research Scientist, 1995-1996, Plant Space Biology Laboratory, Dynamac Corporation, Kennedy Space Center (KSC), 1990-1994
Manager/Research Scientist, Plant Space Biology Laboratory, Bionetics Corporation, KSC, 1990
Space Biologist, Bionetics Corporation, KSC, 1989-1990

Selected Activities, Accomplishments and Recognition

National Space Grant Alliance Board (elected), 2008-present; Vice Chair 2009-present; Secretary 2008-2009
Steering Team, North Carolina Aerospace Initiative, 2009-present
Executive Committee (elected), National Council of Space Grant Directors, 2006-2009 and 2009-present
Co-Chair of the NCSU Shared Research Facility Task Force, 2008-present
Member of the UNC Research Competitiveness Fund planning team, 2008
Board of Advisors, Kenan Fellows for Curriculum and Leadership Development, 2008-present
Program Chair, Annual Meeting of the American Society for Gravitational and Space Biology, 2007 and 2009
Invited member of the NCSU Interdisciplinary Programs Task Force, May 2007-2008
Nominee, NC State University Outstanding Teacher Award, 2006
NASA Space Grant Diversity Working Group (appointed), 2007-2008
Board of Directors, Pisgah Astronomical Research and Science Education Center, 2005-2009
Founding Member of the Exploration Life and Medical Sciences Coalition, 2005-2008
President (elected) of the American Society of Gravitational and Space Biology, 2004-2005
Chair (elected), Exploration Systems Working Group, National Council of Space Grant Directors, 2004-2006
Orr E. Reynolds Distinguished Service Award, American Society for Gravitational and Space Biology, 2005
Nominee, Gertrude Cox Award for Innovation in Teaching and Learning with Technology, 2004 and 2005
Elected as a member of Sigma Xi, 2004
Mentor, Kenan Fellows Program, NCSU, 2002-4, 2003-5, 2005-7, 2008-present
Recipient, NASA Inventions and Contributions Award for the Development of the Porous Tube Nutrient Delivery System for Microgravity Hydroponics, 2003
Scientific Advisor to the BBC (Sir David Attenborough's series entitled *The Life of Mammals*) 2001-2003
Fellow of the NASA Institute for Advanced Concepts, 2000-2007
Recipient of the NASA Group Achievement Award for Participation as a Principal Investigator on the Collaborative Ukrainian Experiment on Space Shuttle STS-89, 1998

Publications and Presentations

Refereed articles (49)

Salinas-Mondragon, R, JD Kajla, IY Perera, CS Brown, and HW Sederoff 2010. Inositol 1,4,5-triphosphate integrates transcriptional regulation of photomorphogenic and tropic growth responses in *Arabidopsis thaliana*. Plant, Cell and Environment (submitted).

Khodakovskaya, M, C Sword, Q Wu, IY Perera, WF Boss, CS Brown, and HW Sederoff 2009. Increasing inositol-1,4, 5-trisphosphate metabolism affects drought tolerance, carbohydrate metabolism, and phosphate-sensitive biomass increases in tomato. Expression of inositolpolyphosphosphate 5-phosphatase increases drought tolerance, total biomass, and lycopene content in tomato. Plant Biotechnology Journal 8:1-14.

Yester, JW, JM Kimbrough, R Salinas-Mondragon, PH Masson, CS Brown, and HW Sederoff 2006. Regulation of transcription in roots of *Arabidopsis* gravity mutants. Grav and Space Biology Bull 19:2.

Kimbrough, J, R Salinas-Mondragon, WF Boss, CS Brown, and H Winter Sederoff 2004. The fast and transient transcriptional network of gravity and mechanical stimulation in the *Arabidopsis* root apex. Plant Physiol. 136:2790-2805.

- Nedukha, OM, EL Kordyum and CS Brown 2003, Microgravity affects the structural-functional organization of soybean cotyledon cells. *Adv. Space Res* 31(10).
- Klymchuk, DO, EL Kordyum, , DK Chapman, TV Vorobyova CS Brown 2003. Changes in vacuolation in the root apex cells of soybean seedlings in microgravity. *Adv. Space Res.* 31(10):2283-2288.
- Klymchuk, DO, CS Brown, DK Chapman, TV Vorobyova, and GM Martyn 2001. Cytochemical localization of calcium in soybean root cap cells in microgravity. *Adv. Space Res.* 27(5):967-972.
- Kuznetsov, OA, CS Brown, HG Levine, WC Piastuch, MM Sanwo-Lewandowski and KH Hasenstein 2001. Composition and physical properties of starch in microgravity-grown plants. *Adv. Space Res.* 28(4):651-658
- Nedukha, O, EL Kordyum, CS Brown, E Kordyum and DK Chapman 2001. The interaction of microgravity and ethylene on the ultrastructure of cells and Ca²⁺ localization in soybean hypocotyls. *J. Grav. Physiol.* 8(1):49-50
- Klymchuk, DO CS Brown and DK Chapman 1999. Ultrastructural organization of cells in soybean root tips in microgravity. *J. Grav. Physiol.* 6:97-98.
- Nedukha, O, CS Brown, E Kordyum and WC Piastuch 1999. Electron cytochemical study of Ca²⁺ in cotyledon cells of soybean grown in microgravity. *J. Grav. Physiol.* 6:123-124.
- Tibbitts, TW, JG Croxdale, CS Brown, RM Wheeler and GD Goins 1998. Ground-based studies and space experiment with potato leaf explants. *Journal of Life Support and Biosphere Science. Journal of Life Support and Biosphere Science* 6:97-106.
- Yorio, NC, RM Wheeler, GD Goins, MM Lewandowski, CL Mackowiak, CS Brown, JC Sager and GW Stutte 1999. Blue light requirements for crop plants used in bioregenerative life support systems. *Journal of Life Support and Biosphere Science.* 5:119-128.
- Cook, ME, JG Croxdale, TW Tibbitts and CS Brown 1998. Development and growth of potato tubers in microgravity. *Advances in Space Research* 21(8/9):1103-1110.
- Musgrave, ME, A Kuang, CS Brown and SW Matthews 1998. Leaf development in *Arabidopsis thaliana* during spaceflight. *Annals of Botany* 81:503-512.
- Goins, GD, NC Yorio, MM Sanwo-Lewandowski and CS Brown 1998. Life cycle experiments with *Arabidopsis* grown under red light-emitting diodes (LEDs). *Journal of Life Support and Biosphere Science* 5:143-149.
- Brown, CS, TW Tibbitts, JG Croxdale and RM Wheeler 1997. Potato tuber formation in the spaceflight environment. *Journal of Life Support and Biosphere Science* 4(2):71-76.
- Croxdale, J, M Cook, TW Tibbitts, CS Brown and RM Wheeler 1997. Structure of potato tubers formed during spaceflight. *Journal of Experimental Botany* 48:2037-2043.
- Goins, GD, Yorio, NC, MM Sanwo and CS Brown 1997. Photomorphogenesis, photosynthesis, and seed yield of wheat plants grown under red light-emitting diodes (LEDs) with and without supplemental blue lighting. *Journal of Experimental Botany* 48:1407-1413.
- Hilaire, E, AQ Paulsen, CS Brown and JA Guikema 1997. Plastid distribution in columella cells of a starchless *Arabidopsis* mutant grown in microgravity. *Plant and Cell Physiology* 38: 490-494.
- Schuerger, AC and CS Brown 1997. Spectral quality affects disease development of three plant pathogens on hydroponically grown plants. *HortScience* 32:96-100.
- Schuerger, AC, CS Brown and EC Stryjewski 1997. Anatomical features of pepper plants (*Capsicum annum* L.) grown under red light-emitting diodes supplemented with blue or far-red light. *Annals of Botany* 79:273-282.
- Hilaire, EM, BV Peterson, JA Guikema and CS Brown 1996. Clinorotation affects soybean seedling morphology and ethylene production. *Plant and Cell Physiology* 37:929-934.
- Johnson, CF, CS Brown, RM Wheeler, JC Sager, DK Chapman and GF Deitzer 1996. Infrared light-emitting diode radiation causes gravitropic and morphological effects in dark-grown oat seedlings. *Photochemistry and Photobiology* 63:238-242.

- Johnson, CF, TW Dreschel, CS Brown and RM Wheeler 1996. Optimization of moisture content and wheat seedling germination in a cellulose acetate medium for a spaceflight experiment. *Advances in Space Research* 18:239-242.
- Tripathy, BC, CS Brown, HG Levine, AD Krikorian 1996. Growth and photosynthetic responses of wheat plants grown in space. *Plant Physiology* 110:801-806.
- Gallegos, GL, EM Hilaire, BV Peterson, CS Brown and JA Guikema 1995. Effects of microgravity and clinorotation on stress ethylene production in two starchless mutants of *Arabidopsis thaliana*. *Journal of Gravitational Physiology* 2:153-154.
- Gallegos, GL, BV Peterson, CS Brown and JA Guikema 1995. Effects of stress ethylene inhibitors on sweet clover (*Melilotus alba* L) seedling growth in microgravity. *Journal of Gravitational Physiology* 2:151-152.
- Hilaire, E, CS Brown and JA Guikema 1995. Clinorotation affects soybean seedling morphology. *Journal of Gravitational Physiology* 2:149-150.
- Hilaire, E, JA Guikema and CS Brown 1995. The fluid processing apparatus: From flight hardware to electron micrographs. *Journal of Gravitational Physiology* 2:165-166.
- Hilaire, E, AQ Paulsen, CS Brown and JA Guikema 1995. Effects of clinorotation and microgravity on sweet clover columella cells treated with cytochalasin D. *Physiologia Plantarum* 95:267-273.
- Hilaire, E, AQ Paulsen, CS Brown and JA Guikema 1995. Microgravity and clinorotation cause redistribution of free calcium in sweet clover columella cells. *Plant and Cell Physiology* 36:831-837.
- Hilaire, E, AQ Paulsen, CS Brown and JA Guikema 1995. Cortical microtubules in sweet clover columella cells developed in microgravity. *Plant and Cell Physiology* 36:1387-1392.
- Brown, CS, AC Schuerger and JC Sager 1995. Growth and photomorphogenesis of pepper plants under red light emitting diodes supplemented with blue or far-red illumination. *Journal of the American Society for Horticultural Science* 120:808-813.
- Piastuch, WC and CS Brown 1995. The effects of chronic clinorotation on protein expression of *Arabidopsis thaliana*. *Journal of Plant Physiology* 146:329-332.
- Tripathy, BC and CS Brown 1995. Root-shoot interaction in the greening of wheat seedlings grown under red light. *Plant Physiology* 107:407-411.
- Brown, CS and WC Piastuch 1994. Starch metabolism in germinating soybean cotyledons is sensitive to clinorotation and centrifugation. *Plant, Cell and Environment* 17:341-344.
- Brown, CS, WC Piastuch and WM Knott 1994. Soybean cotyledon starch metabolism is sensitive to altered gravity conditions. *Advances in Space Research* 14:107-110.
- Dreschel, TW, CS Brown, WC Piastuch, CR Hinkle and WM Knott 1994. Porous tube plant nutrient delivery system development: A device for nutrient delivery in microgravity. *Advances in Space Research* 14:47-51.
- Obenland, DM and CS Brown 1994. The influence of altered gravity on carbohydrate metabolism in excised wheat leaves. *Journal of Plant Physiology* 144:696-699.
- Schuerger, AC and CS Brown 1994. Spectral quality may be used to alter plant disease development in a CELSS. *Advances in Space Research* 14:395-398.
- Brown, CS, TW Dreschel, WM Cox and PV Chetirkin 1992. The vacuum operated nutrient delivery system: Hydroponics for microgravity. *HortScience* 27:1183-1185.
- Takahashi, H, CS Brown, TW Dreschel and TK Scott 1992. Root hydrotropism in a porous tube water delivering system. *HortScience* 27:430-432.
- McClure, BA, G Hagen, CS Brown, MA Gee and TJ Guilfoyle 1989. Transcription, organization and sequence of an auxin-regulated gene cluster in soybean. *The Plant Cell* 1:229-239.
- Brown, CS and SC Huber 1988. Reserve mobilization and starch formation in soybean (*Glycine max*) cotyledons in relation to seedling growth. *Physiologia Plantarum* 72:518-524.

- Brown, CS and SC Huber 1987. Photosynthesis, reserve mobilization and enzymes of sucrose metabolism in soybean (*Glycine max*) cotyledons. *Physiologia Plantarum* 70:537-543.
- Brown, CS, E Young and DM Pharr 1985. Rootstock and scion effects on carbon partitioning in apple leaves. *Journal of the American Society for Horticultural Science* 110:701-705.
- Brown, CS, E Young and DM Pharr 1985. Rootstock and scion effects on the seasonal distribution of dry weight and carbohydrates in young apple trees. *Journal of the American Society for Horticultural Science* 110:696-701.
- Brown, CS, E Young and DM Pharr 1983. An enzymatic assay for sorbitol in apple organs. *HortScience* 18:469-470.

Book Chapters / Technical Memoranda (23)

- Brown, CS, Davies, E, Ferl, RJ, Stankovic, B and Winter-Sederoff, HW 2008. Plant(s) for space exploration. In: *Plant Tropisms*, P. Masson and S. Gilroy (eds.). Blackwell Publishing, Iowa, pp. 183-196.
- Goins, GD, HH Kim, CS Brown and CA Shoemaker 2004. Defining basic ground-based experiments which assess the restorative value of live plant micro-gardens for humans. *SAE Journal* (submitted).
- Brown, CS 2000. Photosynthesis and starch Metabolism in space-grown plants. In: IGE Series No. 28 "Perspectives of Plant Research in Space". Institute of Genetic Ecology, Tohoku University, Sendai, pp. 75-82.
- Tibbitts, TW, CS Brown, JG Croxdale, and RM Wheeler 1998. Experiment IX. Astroculture: Growth and starch accumulation in potato tuber. NASA TM-1998-208697, pp. 9.221-9.228.
- Brown, CS, TW Tibbitts, JG Croxdale and RM Wheeler 1996. Potato tuber formation and metabolism in the spaceflight environment. *SAE Paper #96-1393*.
- Brown, CS, BC Tripathy and GW Stutte 1996. Photosynthesis and carbohydrate metabolism in microgravity. In: H Suge ed. *Plants in Space Biology*. Tohoku University Press. Sendai, Japan, pp 127-134.
- Goins, GD, NC Yorio, MM Sanwo and CS Brown 1996. Seed-to-seed growth of superdwarf wheat and Arabidopsis using red light-emitting diodes (LEDs): A report conducted for NASA's proposed plant research unit (PRU). NASA TM-11678.
- Heathcote, DG, CS Brown, GD Goins,, M Kliss, H Levine, PA Lomax, RL Porter and RM Wheeler 1996. The Plant Research Unit: Long-term plant growth support for space station. *Proceedings of the Sixth European Symposium on Life Science Research in Space*. ESA SP 390.
- Brown, CS 1995. Non-gravitational factors affecting plant growth in spaceflight. *Institute of Genetic Ecology Newsletter* 7:9-12.
- Dooley, HA, AE Drysdale, JC Sager and CS Brown 1995. Bioregenerative life support system design. *SAE Paper #951493*.
- Piastuch, WC, TW Dreschel, JO Bledsoe and CS Brown 1995. A small, closed, computer controlled chamber for study of atmospheric and water availability effects on plant growth and metabolism. *SAE Paper #957656*
- Brown, CS, TW Dreschel and WM Cox 1994. The vacuum operated nutrient delivery system (VONDS): Technology for the culture of plants in microgravity. *NASA Tech Briefs* 18:128. KSC-11606.
- Brown, CS 1993. Photosynthesis and carbohydrate metabolism in higher plants in altered gravity conditions. NASA TM-4501:25-29.
- Bushong, WE, RC Fox, CS Brown, RR Biro and TW Dreschel 1993. Clinostat delivers power to plant-growth cabinets. *NASA Tech Briefs* 17:92. KSC-11537.
- Dreschel, TW and CS Brown 1993. Water-conserving plant growth system. *NASA Tech Briefs* 17:89-90. KSC-11536.
- Dreschel, TW and CS Brown 1992. Porous tube nutrient delivery system for the Space Shuttle mid-deck locker Plant Growth Unit (PGU). *NASA Tech Briefs* 17:89-90.

- Dreschel, TW, CS Brown, WC Piastuch, CR Hinkle, JC Sager, RM Wheeler and WM Knott 1992. A summary of porous tube plant nutrient delivery investigations from 1985-1991. NASA TM-107546.
- Dreschel, TW, CS Brown, CR Hinkle, JC Sager and WM Knott 1990. Developing future plant experiments for spaceflight. SAE Paper # 90-4533.
- Guilfoyle, TJ, BA McClure, G Hagen, CS Brown, MA Gee and A Franco 1990. Regulation of plant gene expression by auxins. In: JP Gustafson ed., *Gene Manipulation in Plant Improvement II*. Plenum Press, New York, pp 401-418.
- Guilfoyle, TJ, BA McClure, G Hagen, CS Brown, R Wright and MA Gee 1990. Auxin-regulated gene expression. In: MC Elliott and I Machakova eds., *Molecular Aspects of Hormonal Regulation of Plant Development*. SPB Academic Publishing, The Hague, pp 195-201.
- Hagen, G, B McClure, C Brown, M Gee and T Guilfoyle 1990. Auxin and gene expression. In: RP Pharis and SB Rood eds., *Growth Substances 1988*. Springer, Berlin, pp 95-99.
- Guilfoyle, T, B McClure, G Hagen, C Brown, D Wright and M Gee 1989. Rapid activation of a gene cluster by auxin. In: R Goldberg ed., *The Molecular Basis of Plant Development*. Alan R Liss, Inc. New York, pp 203-210.
- Brown, CS and SC Huber 1987. Characteristics of soybean cotyledon photosynthesis. In: J Biggins ed., *Progress in Photosynthesis Research Vol. 3*. Martinus Nijhoff Publishers, Boston, pp 725-728.

Grants and Contracts

Research (\$9,119,488 current and past; \$445,812 pending)

Title – The Effect of Space Flight on Transgenic Arabidopsis Plants with Compromised Signaling (pending)
Funding Source – NASA
Amount –\$445,812
Duration – 06/10 – 05/12
Role in project – Co-Investigator (PI – Imara Perera, NC State University)
Description – Molecular analysis of transgenic Arabidopsis plants grown in microgravity aboard the International Space Station.

Title – Center for Sustainable Life Support for Human Space Exploration (PGG VII)
Funding Source – NASA
Amount –\$410,000
Duration – 01/01/10 – 12/23/10
Role in project – Co-Investigator (PI – Heike Winter Sederoff, NC State University)
Description – Exploring the development of plants for long-term human exploration

Title – Center for Sustainable Life Support (PGG VI)
Funding Source – NASA ESMD
Amount - \$361,494
Duration – 01/09 – 12/09
Role in project – Co-Investigator (PI – Heike Winter Sederoff, NC State University)
Description – Exploring the development of plants for long-term human exploration

Title – Molecular Basis of Plant Response to Abiotic Challenges Relevant for Space Exploration (PGG V)
Funding Source - NASA ESMD
Amount - \$464,080

Duration – 01/07 – 12/07

Role in project – Principal Investigator

Description – A continuation of PGG IV - To identify gravity and stress related signaling pathways in plants.

Title – Molecular Basis of Plant Response to Abiotic Challenges Relevant for Space Exploration (PGG IV)

Funding Source - NASA ESMD

Amount - \$496,000

Duration – 01/06 – 12/06

Role in project – Principal Investigator

Description – To identify gravity and stress related signaling pathways in plants.

Title – A Genomic Analysis of the Effects of Space Flight on Transgenic Plants with Compromised Signaling Pathways

Funding Source – NASA ESMD

Amount - \$923,000 / \$30,000*

Duration – 06/05-05/09

Role in project – Principal Investigator

Description – To identify and characterize changes in transcript levels that are specifically mediated by $InsP_3$ during spaceflight in transgenic *Arabidopsis* plants.

**This project, along with many other fundamental biology projects, was de-selected by NASA in late 2005 as the agency re-aligns its budget. Closeout funding for \$30,000 was awarded and counted towards the grand total.*

Title – Early Regulatory Elements of the Gravity-Specific Transcriptional Network (PGG III)

Funding Source - NASA OBPR

Amount - \$467,227

Duration – 01/05-12/05

Role in project – Principal Investigator

Description – To detail the transcriptional regulation of a set of gravity-specific genes in *Arabidopsis*.

Title – Regulatory Networks in Plant Gravity Signaling (PGG II)

Funding Source - NASA OBPR

Amount - \$497,000

Duration – 01/04-12/04

Role in project – Principal Investigator

Description – To identify transcript abundance levels in gravity signaling pathways in plants.

Title – Transcriptional and Translational Regulation of Gravitropism in the Maize Pulvinus

Funding Source – NASA OBPR

Amount - \$482,687

Duration – 01/04-12/06

Role in project – Collaborator (PI – Heike Winter Sederoff)

Description – To examine the translational control of selective transcripts as an essential regulatory event in plant gravitropic signal transduction and response.

Title - Development of a Self-Calibrating Dissolved Oxygen Microsensor for the Monitoring and Control of Plant Growth in Space

Funding Source - NASA AHST

Amount - \$80,000

Duration – 05/02-03/04

Role in project – Co-Principal Investigator (Co-PI – Chang-Soo Kim, Missouri University of Science and Technology)

Description - Developed novel microsensors for the detection of dissolved oxygen in hydroponic systems suitable for spaceflight applications.

Title - A Genomic Analysis of Plant Gravity Sensing and Response (PGG I)

Funding Source - NASA OBPR

Amount - \$400,000

Duration – 6/02-12/03

Role in project – Principal Investigator

Description - Identified global gene expression changes in the initial phase of root gravitropism.

Title - Programmable Plants for Human Life Support

Funding Source – NASA Institute for Advanced Concepts (\$75K), Kenan Institute for Engineering, Technology & Science at NCSU (\$6K)

Amount - \$81,000

Duration – 06/00-11/00

Role in project – Principal Investigator

Description - Performed a feasibility study and generated a report on the use of genomics and nanotechnology for the development of a bioregenerative life support system for human space exploration.

Title - NASA Specialized Center for Research and Training (NSCORT) in Gravitational Biology

Funding Source - NASA OBPR

Amount - \$5,350,000

Duration – 03/96-03/03

Role in project – Co-Principal Investigator (Co-Pi's – Eric Davies, Wendy Boss, and Steven Huber)

Description - Along with 11 other faculty members, elucidated early signaling events in the response of plants to gravistimulation; provided support for 10 postdoctoral fellows, 8 graduate students, and 40 undergraduates; performed outreach activities with over 700 teachers and 5,800 students; and developed an undergraduate course in *Space Biology*.

Education and Training (\$4,732,187 current and past; \$2,900,000 pending)

Title – North Carolina Space Grant 2010 – 2015 (pending)

Funding Source – NASA Education

Amount - \$2,900,000

Duration – 03/10 – 03/15

Role in project – Principal Investigator and Director

Description – To promote and develop aerospace and space-related science, engineering and technology programs in North Carolina with all levels of educational institutions, industry and government.

Title – North Carolina Space Grant 2005 - 2010

Funding Source – NASA Education

Amount - \$3,647,892

Duration – 03/05 – 03/10

Role in project – Principal Investigator and Director

Description – To promote and develop aerospace and space-related science, engineering and technology programs with all levels of educational institutions, industry and government.

Title – North Carolina Space Grant

Funding Source – North Carolina General Assembly

Amount - \$200,000 annual recurring . Total since 2005 - \$998,787

Duration – 06/05 – continuous.

Role in project – Principal Investigator and Director

Description – To promote and develop aerospace and space-related science, engineering and technology programs with all levels of educational institutions, industry and government.

Title - Education and Public Outreach Supplement to FSB-2003-1068-1016 “Transcriptional and Translational Regulation of Gravitropism in the Maize Pulvinus”

Funding Source - NASA OBPR

Amount - \$30,000

Duration – 01/05-12/07

Role in project – Collaborator (PI – Heike Winter Sederoff)

Description – To support for a Kenan Teaching Fellow in association with funded research project.

Title - *Space Biology*: Capturing Selected Lectures in Digital Format

Funding Source - NASA Kennedy Space Center

Amount - \$38,000

Duration – 09/02-03/04

Role in project – Principal Investigator

Description - Captured selected lectures and lecture materials from the course *Space Biology* in digital format.

Title - *Space Biology* Phase I: Conversion of Existing Digital Lecture Materials Using Synchronized Multimedia Integration Language

Funding Source – NCSU DELTA

Amount - \$6,400 plus DELTA professional services

Duration – 02/03-06/03

Role in project – Principal Investigator

Description – Initiated development of an asynchronous, web-based, on-line *Space Biology* undergraduate course.

Title - *Space Biology* Phase II: Conversion of Existing Digital Lecture Materials Using Synchronized Multimedia Integration Language

Funding Source – NCSU DELTA

Amount – DELTA Professional Services (estimated at \$6,200)

Duration – 08/03-05/04

Role in project – Principal Investigator

Description – Completed development of an asynchronous, web-based, on-line *Space Biology* undergraduate course.

Title – Involving Expert Lecturers in *Space Biology* Using Video Teleconferencing
Funding Source – North Carolina Space Grant Consortium
Amount - \$1,920
Duration – 06/98-01/99
Role in project – Principal Investigator
Description – Used NC-REN to include remote guest speakers in *Space Biology*.

Title – Using NC-REN to Offer a Unique Course Across the State and From the Kennedy Space Center
Funding Source – NCSU Instructional Grant Program
Amount - \$2,988
Duration – 08/97-07/98
Role in project – Principal Investigator
Description – Linked multiple sites across the state and nation for students and instructors in *Space Biology*.

Other Grants and Contracts (\$806,819 current and past)

Title – Base Camp Sustainability Workshop
Funding Sources – US Army Research Office
Amount - \$40,000
Duration – 07/07 - 06/08
Role in project – PI
Description – To conduct a workshop on technologies for military base camp sustainability and life support systems for space exploration.

Title – ASGSB Annual Meeting
Funding Sources – NASA
Amount - \$25,000
Duration – 07/07 - 06/08
Role in project – PI
Description – Support for the annual meeting for the American Soc. for Gravitational and Space Biology.

Title – The AeroSpace Economy in North Carolina
Funding Sources – NC Space Grant
Amount - \$5,000
Duration – 07/06-06/07
Role in project – PI
Description – To explore the feasibility of developing the NC aerospace economy in the state's seven economic development zones.

Title – The Exploration Life and Medical Sciences Coalition
Funding Sources – The American Society for Gravitational and Space Biology
Amount - \$2,000
Duration – 03/06-02/07
Role in project – Founding member
Description – to actively engage the scientific community, life sciences entrepreneurs, and the general public in the public policy process to support a robust national research effort that contributes to space exploration, scientific discoveries from space research, and resulting benefits for humanity.

Title – The North Carolina Space Initiative

Funding Sources – NC State University Vice Chancellor for Research and Graduate Studies, the Kenan Institute for Engineering, Technology & Science and the UNC Office of the President

Amount - \$680,319

Duration – 01/01-06/08

Role in project – Director

Description – The North Carolina Space Initiative facilitates coordinated efforts among various educational, governmental and commercial organizations to develop and promote space-related research activities with strong research, educational and commercial value.

Title – Intergovernmental Personnel Act Agreement for Dr. Christopher S. Brown with NASA/KSC

Funding Sources – NASA Kennedy Space Center

Amount - \$54,500

Duration – 05/01-05/02

Role in project – Principal Investigator

Description – Dr. Brown worked with the Chief of the NASA Kennedy Space Center (KSC) Biological Sciences Branch on long-range program planning. He established strategic linkages and partnerships between NASA KSC and academic institutions and local research organizations involved in research and development.

Teaching

From 1996-2009, “Space Biology” has been offered at NCSU. Undergraduate students are the target audience for the course, however participants have included graduate students, postdoctoral fellows, teachers, high school students and working professionals. The course has been taken by NCSU students as well as students from 5 other North Carolina universities and the NC School of Science and Mathematics. Additionally, taped lectures were offered to more than 3,000 participants in a closed-circuit video training series at the Kennedy Space Center in 1999. From 2004-2009 "Space Biology" was a Distance Education offering through NCSU's DELTA program.

1995 – Space Biology (BIO 4935) at the Univ of Central FL, Orlando, FL, 35 students.

1996 – Space Biology (BO 590G), NCSU, 9 students

1997 – Space Biology (BO 295T, sec 003), NCSU, 15 students

1998 – Space Biology (BO 277, sec 001), NCSU, 16 students

1999 – Space Biology (BO 277, sec 001), NCSU, 21 students

2000 – Space Biology (BO 277 and 595, sec 001), NCSU, 19 students

2001 – Space Biology (BO 277 and 595, sec 001), NCSU, 24 students

2002 – Space Biology (BO 277 and 595, sec 001 and 601), NCSU, 31 students

2004 – Space Biology (BO 277 and 595, sec 001 and 601), NCSU, 36 students

2005 – Space Biology (BO 277 and 595, sec 001 and 601), NCSU, 40 students

2006 – Space Biology (BO 277 and 595, sec 001 and 601), NCSU, 57 students

2007 – Space Biology (PB 277 and 595, sec 001 and 601), NCSU, 35 students

2008 – Space Biology (PB 277 and 595, sec 001 and 601), NCSU, 37 students

2009 – Space Biology (PB 277 and 595, sec 001 and 601), NCSU, 34 students

Advising and Mentoring

Graduate Committees

Co-Major Advisor (with Professor Jim Guikema) for doctoral candidate Emmanuel Hilaire. He received his Ph.D. in Biology from Kansas State University in 1996.

Committee member for Master of Science candidate Wei Zhao. He received his MS degree in Botany from NC State University in 2000.

Committee member for doctoral candidate Jeffrey Coker. He received his Ph.D. in Botany from North Carolina State University in 2004.

Committee member for doctoral candidate Crystal Gomillion. She received her Ph.D. in Science Education from North Carolina State University in 2007.

Committee member for doctoral candidate Sarah Gooden. She received her Master's in Science Education from North Carolina State University in 2007.

Committee member for doctoral candidate Jyoti Kjala who began her studies at NC State University in 2006.

Postdoctoral Advising

Postdoctoral advisor for Dr. David Obenland from 1992-1993 at the Kennedy Space Center. Dr. Obenland is currently a Plant Physiologist with the USDA-ARS at the San Joaquin Valley Agricultural Sciences Center.

Postdoctoral advisor for Dr. Baishnab Tripathy from 1993-1994 at the Kennedy Space Center. Dr. Tripathy is currently a Professor at Jawaharlal Nehru University in New Delhi, India.

Postdoctoral advisor for Dr. Monica Sanwo-Lewandowski from 1994-1996 at the Kennedy Space Center. Dr. Sanwo-Lewandowski on staff with the Institute of Food and Agricultural Science at the University of Florida.

Undergraduate Advising

Served as advisor to Botany major Emily Pulley on her successful attempt to win a competitive internship (\$5,000) from the North Carolina Space grant Consortium to spend the summer at the Kennedy Space Center. She worked with KSC scientists on nutrient delivery systems for microgravity. Advised Reathel Geary as he competed for and won a grant and opportunity to fly an experiment of the Space Shuttle. Reathel studied DNA ligation in microgravity with then postdoctoral fellow Dr. Sarah Wyatt.

K-12 Teacher Mentoring

Mentor for four public school teachers in the Kenan Teaching Fellows program from 2002-present.

Kenan Teaching Fellows are public school teachers selected through a competitive process to participate in a two-year fellowship, all while remaining active in the classroom. During their fellowship, Kenan Fellows conduct research and work in partnership with scientists, university faculty, businesses, museums, and the NC Department of Public Instruction (NCDPI).

Professional Societies

American Association for the Advancement of Science

American Institute for Aeronautics and Astronautics

American Society for Gravitational and Space Biology

Committee on Space Research (COSPAR)

National Council of Space Grant Directors
International Society for Gravitational Physiology

Consulting Activities

University of Florida, Gainesville, FL, 2002 – 2003. Plan, conduct and submit report on the International Space Station Research Institute Workshop on Biological Science.

Orbital Technologies Corporation, Madison, WI, 2003 – 2005. Member of Science Advisory Board.

Provide advice on the development of hardware for plant science research on the Space Shuttle and the International Space Station.

Clinical Tools, Inc., 2004 – 2006. Provide advice on the development of NASA educational materials.

US Satellite, 2007-2009. Develop and deliver instructional materials via the web to teachers across the country.