

# *THOMAS JOHN GOODWIN, PhD*

## *Curriculum Vitae*

### ***EDUCATION***

---

- 2002      Doctor of Philosophy  
The Union Institute and University  
Physiology and Bioengineering Science  
Field Studies: University of Michigan/Bioengineering, Ann Arbor, MI.  
and NASA Johnson Space Center, Houston, TX.
- 1983      Master of Arts in Neuroscience  
University of Houston
- 1974      Bachelor of Arts in Biology  
St. Mary's University

### ***PROFESSIONAL AFFILIATIONS***

---

- American Association for the Advancement of Science
- American Physiological Society
- American Society for Cell Biology
- International Federation for the Advancement of Genetic Engineering and Biotechnology
- Sigma XI The Scientific Research Society
- Society for In Vitro Biology

### ***SPECIAL EXPERTISE***

---

Dr. Goodwin's research focuses on cell physiology and organ tissue bioengineering, development of *ex vivo* physiological 3D systems, and the three-dimensional biology of human and animal cells. Complex recapitulated tissues may serve as surrogates for studies of tumour physiology, viral and bacterial infectivity, and genomic responses to a myriad of cellular conditions including genomic modulation and regulation due to chemical, physical and environmental stimuli such as may be seen in the Earth and Space environment. The recapitulation of human tissues also serves as a platform to study man-machine interfaces.

Additionally, Dr Goodwin is a leading expert in the cellular, molecular genetic, and physiological effects of electromagnetic (EM) fields on human tissues. His work at the genetic level has been referred to as seminal to the understanding of PEMF effects on living cells.

Dr. Goodwin's expertise encompasses techniques in tissue and organ bioengineering and biochemistry, separations technology, specifically high-performance liquid chromatography, column chromatography, and methodologies to study cellular ion transport at the sub-cellular level and their effects on genetic manipulation.

## PROFESSIONAL EXPERIENCE

---

- Nov. 2009-Present Adjunct Scientist, Southwest National Primate Research Center (SNPRC)
- Oct. 2009- Present Project Manager/Scientist, Non Exercise Physiological Countermeasures Project (NxPCM)  
<http://www.nasa.gov/centers/johnson/slsd/about/divisions/hacd/project/nxpcm.html>
- July 2008-Present Adjunct Assistant Professor, Department of Surgery, Division of Cardiothoracic Surgery, School of Medicine, University of Texas, Galveston, Texas.
- June 2007-Present *Ad Hoc Reviewer for Journal of Tissue Engineering*
- Feb.2007-Present Project Scientist, Non Exercise Physiological Countermeasures Project (NxPCM)  
<http://www.nasa.gov/centers/johnson/slsd/about/divisions/hacd/project/nxpcm.html>  
[http://lsda.jsc.nasa.gov/docs/research/research\\_detail.cfm?experiment\\_type\\_code=18&research\\_type](http://lsda.jsc.nasa.gov/docs/research/research_detail.cfm?experiment_type_code=18&research_type)
- Feb. 2003 -Present Manager, Disease Modelling/Tissue Analogues Laboratory  
<http://www.nasa.gov/centers/johnson/slsd/about/divisions/hacd/laboratories/tissue-analogues.html>  
<http://www.nasa.gov/centers/johnson/slsd/about/divisions/hacd/publications/tissue-analogues.html>
- Feb. 2005-Aug. 2007 Deputy Project Manager, Non Exercise Physiological Countermeasures Project (NxPCM)
- Feb. 2005-Oct. 2005 Project Scientist Integrated Cell Science Project
- May 2003-Present Human Adaptations and Countermeasures Div. Representative to the NASA Biosafety Committee chaired by Dr. Duane Pierson.  
[http://www.sivb.org/mem\\_c\\_Laboratory\\_Materials.asp](http://www.sivb.org/mem_c_Laboratory_Materials.asp)
- Dec. 2000 - 2005 Chief Scientist for the Cellular Biotechnology Facility for ISS  
[http://docs.google.com/viewer?a=v&q=cache:ttpcRK6eBl4J:gaberieger.com/documents/brochures/BTF\\_Magazine.pdf+/search%3Fhl%3Den%26biw%3D806%26bih%3D610%26q%3D%2Bsite:gaberieger.com%2Bgabe%2Brieger%2Bbiotechnology%2Bnasa&hl=en&gl=us&pid=bl&srcid=ADGEESjLKjTSB8WQUoxtpBj5pK0Si3UZhriB\\_yU7h6NrM\\_2scsEpGEV71LwaCZmXCCgIq6emg-ugFR-TgdIIFWbAD0I2FIKpG\\_oDMYtqmUhbMtFVBjMIQSAM8yXSmrbsQ6cmCrvHkTGxU&sig=AHIEtbQLtIpRe\\_q4hHZhhfzl\\_7fUeTydRw](http://docs.google.com/viewer?a=v&q=cache:ttpcRK6eBl4J:gaberieger.com/documents/brochures/BTF_Magazine.pdf+/search%3Fhl%3Den%26biw%3D806%26bih%3D610%26q%3D%2Bsite:gaberieger.com%2Bgabe%2Brieger%2Bbiotechnology%2Bnasa&hl=en&gl=us&pid=bl&srcid=ADGEESjLKjTSB8WQUoxtpBj5pK0Si3UZhriB_yU7h6NrM_2scsEpGEV71LwaCZmXCCgIq6emg-ugFR-TgdIIFWbAD0I2FIKpG_oDMYtqmUhbMtFVBjMIQSAM8yXSmrbsQ6cmCrvHkTGxU&sig=AHIEtbQLtIpRe_q4hHZhhfzl_7fUeTydRw)
- Dec. 2000 - 2002 Project Manager/Scientist for Commercial Space Flight Office StelSys Experiment  
<http://www.nasa.gov/centers/marshall/news/background/facts/stelsys.html>
- Oct. 2000 - Present Project Manager/Scientist for the ARCTIC Freezer System for the International Space Station (ISS) <http://www.nasa.gov/centers/marshall/news/background/facts/arctic.html>
- Aug. 1999 – 2003 Project Manager/Scientist for MRPO STS107/BDS-05 Experiment for ISS/Columbia  
[http://spaceresearch.nasa.gov/sts-107/107\\_BDS05.pdf](http://spaceresearch.nasa.gov/sts-107/107_BDS05.pdf).

## PROFESSIONAL EXPERIENCE (continued)

June 1999 – Present	NASA Chief Scientist for the Minus Eighty Freezer MELFI, Cryogenic Freezer CRYO and Glacier systems for International Space Station
Sept. 1997 - Present	Co-Director of the Tulane University Environmental Astrobiology Center under the NASA Space Act Agreement.
Sept. 1996 - Present	Special appointments as Adjunct Instructor in the Departments of Physiology and Medicine at the Tulane University Medical Center, New Orleans, LA.
March 1993 - 2000	National Aeronautics and Space Administration (NASA) Biotechnology Flight Definition/Cell Biology Manager at Johnson Space Center (JSC).
Sept. 1991 - March 1993	Biotechnology Laboratories Manager for the Biomedical Research Section of KRUG Life Sciences Division.
June 1987 - Aug. 1991	Research Cell Biologist for the Biomedical Research Section of KRUG's Life Science Division.
Sept. 1985 - June 1987	Research Associate and Laboratory Supervisor in the Department of Surgery at The University of Texas Health Science Center-Houston.
Dec. 1979 - Sept. 1985	Research Associate and Laboratory Supervisor at The University of Texas Medical School at Houston in the Department of Surgery, Division of Organ Transplantation.
Oct. 1973 - Dec. 1979	Assistant Research Scientist at the Southwest Foundation for Research and Education in San Antonio, Texas.

## AWARDS

2011	NASA Certificate of Recognition for a disclosure entitled " Electromagnetic Time-Variance Magnetic Fields (TVMF) to generate, and re-grow Cartilage Cells by a Noninvasive Method", MSC-24541-1
2010	NASA Performance Award In Recognition Of Excellence In The Performance Of Assigned Duties
2009	NASA Performance Award In Recognition Of Excellence In The Performance Of Assigned Duties
2008	NASA Certificate Of Recognition For The Disclosure Of An Invention Titled "Improved Three Dimensional Cell To Tissue Development Process:" MSC-23983-1
2008	NASA Performance Award In Recognition Of Excellence In The Performance Of Assigned Duties
2008	NASA Certificate Of Recognition For The Disclosure Of An Invention Titled" Natively Glycosylated Mammalian Biological Molecules Produced By Electromagnetically Stimulating Living Mammalian Cells." MSC-23979-1
2008	NASA Certificate Of Recognition For The Disclosure Of An Invention Titled "Apparatus For Enhancing Tissue Repair In Mammals:." MSC-23981-1
2008	NASA Technical Brief Space Act Award for the Patent, Methods For Growing Tissue-Like 3D Assemblies (TLA) Of Human Broncho-Epithelial Cells MSC-24164-1
2008	NASA Space Act Award for the Patent, "Three- Dimensionally Engineered Normal Human Bronchio-Epithelial Tissue Like Assemblies: Targets for Human Respiratory Viral Infections", MSC-24164-1
2007	NASA Performance Award In Recognition Of Excellence In The Performance Of Assigned Duties

## AWARDS (Continued)

---

- 2006 NASA Performance Award In Recognition Of Excellence In The Performance Of Assigned Duties
- 2005 NASA Certificate Of Recognition For The Patent Award Of An Invention Titled "Production Of Functional Proteins: Balance Of Shear Stress And Gravity."
- 2005 NASA Performance Award In Recognition Of Excellence In The Performance Of Assigned Duties
- 2005 **NASA Group Achievement Award** For Untiring Dedication To The NASA Cell Science And Tissue Engineering Program, Which Has Been Recognized By The Science Community As Fostering Outstanding Development In Basic, Applied, And Exploration Research Using Cellular Systems.
- 2004 NASA Space Act Award For The Patent "Growth Stimulation Of Biological Cells And Tissues By Electromagnetic Fields And Uses Thereof".
- 2004 NASA Performance Award In Recognition Of Excellence In The Performance Of Assigned Duties
- 2003 NASA Performance Award In Recognition Of Excellence In The Performance Of Assigned Duties
- 2002 **Superior Achievement Award As Chief Scientist For The Development Of The Arctic System And The Other Freezer Systems For ISS.**
- 2002 NASA Performance Award In Recognition Of Excellence In The Performance Of Assigned Duties.
- 2002 NASA Superior Accomplishment Award For The Exceptional Accomplishment Of A Special Effort That Significantly Benefited The Lyndon B. Johnson Space Center
- 2002 NASA Special Space Flight Team Achievement Award For Exemplary Effort And Technical Achievement In The Successful Delivery Of The Arctic Freezer To The ISS Aboard STS-110/8a.
- 2002 NASA Special Space Flight Individual Achievement Award For Exemplary Effort And Technical Achievement In The Successful Delivery Of The Arctic Freezer To The ISS Aboard STS-110/8a.
- 2001 NASA Performance Award In Recognition Of Excellence In The Performance Of Assigned Duties.
- 2000 NASA Certificate Of Recognition For The Disclosure Of An Invention Titled "Growth Stimulation Of Biological Cells And Tissues By Electromagnetic Fields And Uses Thereof.
- 2000 NASA Performance Award In Recognition Of Excellence In The Performance Of Assigned Duties.
- 1999 **NASA Group Achievement Award.** Outstanding Contributions To The Mir Phase I Space Station Program
- 1999 NASA Performance Award In Recognition Of Excellence In The Performance Of Assigned Duties.
- 1998 NASA Certificate Of Recognition For The Disclosure Of An Invention Titled "Production Of Functional Proteins: Balance Of Shear Stress And Gravity."
- 1998 NASA Certificate Of Recognition For The Creative Development Of A Technical Innovation Which Has Been Proposed For Publication As A NASA Technical Brief Titled "Production Of 1-25dih Vitamin D3, Erythropoietin And Other Products."
- 1998 NASA Performance Award In Recognition Of Excellence In The Performance Of Assigned Duties.
- 1997 NASA Performance Award In Recognition Of Excellence In The Performance Of Assigned Duties.

## AWARDS (Continued)

---

- 1996 NASA Certificate Of Recognition For The Creative Development Of A Technical Contribution Which Has Been Determined To Be Of Significant Value In The Advancement Of The Space And Aeronautical Activities Of NASA, And Is Titled: "Recombinant Protein Production And Insect Cell Culture And Process."
- 1996 NASA Certificate Of Recognition For The Disclosure Of An Invention Titled "Recombinant Protein Production And Insect Cell Culture And Process."
- 1996 NASA Certificate Of Recognition For The Disclosure Of An Invention Titled "A Method For Producing Non-Neoplastic, Three-Dimensional Mammalian Tissue And Cell Aggregates Under Microgravity Culture Conditions And The Products Produced Therefrom."
- 1996 NASA Performance Award In Recognition Of Excellence In The Performance Of Assigned Duties.
- 1996 NASA Certificate Of Recognition For The Disclosure Of An Invention Titled "Pathogen Propagation In Cultured Three-Dimensional Tissue Mass."
- 1995 NASA Certificate Of Recognition For The Creative Development Of A Technical Innovation Which Has Been Proposed For Publication As A NASA Tech Brief Titled "Electrically Potentiated Growth Of Mammalian Neuronal Tissue Facilitated By Rotating Wall Vessel Culture"
- 1995 NASA Certificate Of Recognition For The Creative Development Of A Technical Innovation Which Has Been Proposed For Publication As A NASA Tech Brief Titled "Three Dimensional Optic Tissue Culture And Process."
- 1995 NASA Certificate Of Recognition For The Disclosure Of An Invention Titled "Three Dimensional Optic Tissue Culture And Process."
- 1995 NASA Certificate Of Recognition For The Creative Development Of A Technical Innovation Which Has Been Proposed For Publication As A NASA Tech Brief Titled "A Novel Process System For Insect-Cell Cultivation And Recombinant Protein Production."
- 1994 NASA Performance Award In Recognition Of Excellence In The Performance Of Assigned Duties.
- 1994 NASA/Johnson Space Center Gem Award "Going The Extra Mile."
- 1994 NASA Certificate Of Recognition For The Creative Development Of A Technical Innovation Which Has Been Proposed For Publication As A NASA Tech Brief Titled "A Process For Developing High-Fidelity Three-Dimensional Tumor Models Of Human Prostate Carcinoma."
- 1994 NASA Certificate Of Recognition For The Creative Development Of A Technical Innovation Which Has Been Proposed For Publication As A NASA Tech Brief Titled "Horizontal Rotating-Wall Vessel Propagation Of *In Vitro* Human Tissue."
- 1994 NASA Certificate Of Recognition For The Creative Development Of A Technical Innovation Which Has Been Proposed For Publication As A NASA Tech Brief Titled "A Process For Developing High-Fidelity Three-Dimensional Tumor Models Of Human Bladder Carcinoma."
- 1994 NASA Certificate Of Recognition For The Creative Development Of A Technical Innovation Which Has Been Proposed For Publication As A NASA Tech Brief Titled "A Process For Three-Dimensional Culture Of Mammalian Cartilage."

## AWARDS (Continued)

---

- 1994 NASA Certificate Of Recognition For The Disclosure Of An Invention Titled "Multi-Cellular, Three-Dimensional Living Mammalian Tissue (As Amended)."
- 1994 NASA Certificate Of Recognition For The Disclosure Of An Invention Titled "Cultured High-Fidelity Three-Dimensional Human Urogenital Track Carcinomas And Process."
- 1993 NASA/Johnson Space Center Gem Award "Going The Extra Mile"
- 1993 NASA Certificate Of Recognition For The Creative Development Of A Technical Innovation Which Has Been Proposed For Publication As A NASA Technical Brief Titled "A Process For Complex Three-Dimensional Co-Culture Normal Human Small Intestine."
- 1993 NASA Certificate Of Recognition For The Disclosure Of An Invention Titled "Cultured Normal Mammalian Tissue And Process."
- 1993 **NASA Johnson Space Center Inventor Of The Year For Three-Dimensional Co-Culture Process. U.S. Patent 5,153,132.**
- 1993 **NASA Group Achievement Award.** In Recognition Of Outstanding Determination, Performance, And Accomplishments In Bioreactor Engineering And Tissue Culture Research And The Creation Of New Knowledge In Medicine And Biology.
- 1992 Nominated For The **NASA Group Achievement Award For The Successful Flight Of DSO-316** On STS-44
- 1991 Space Act Award For The Creative Development Of A Scientific Contribution Which Has Been Determined To Be Of Significant Value In The Advancement Of The Aerospace Technology Program Of NASA And Is Titled "Three-Dimensional Coculture Process.
- 1990 NASA Certificate Of Recognition For The Creative Development Of A Technical Innovation Which Has Been Selected For Publication Titled "Biological Active Factors Produced By Multicellular Co-Cultivation."
- 1990 NASA Certificate Of Recognition For The Creative Development Of A Technical Innovation Which Has Been Selected For Publication Titled "Three-Dimensional Co-Culture Process."
- 1990 **San Antonio Commissioners Court Award For Outstanding Scientific Achievement.**
- 1990 **San Antonio Mayor's Citation For Outstanding Achievement In A Scientific Field.**
- 1989 **1988 Melbourne W. Boynton Award.** Awarded By The American Astronautical Society For Outstanding Contributions To Biomedical Aspects To Spaceflight.
- 1989 **NASA Group Achievement Award-Space Bioreactor Program, Bioreactor Engineering** And Cell Science Research Team. In Recognition Of Outstanding Accomplishments In The Field Of Bioreactor Engineering And Tissue Culture Research

## DISCLOSURES AND PATENTS

---

- 2011        **US Patent 7,972,821**  
**Goodwin, T.J. et al.** “Production Of Functional Proteins: Balance Of Shear Stress And Gravity”
- 2010        **MSC-24949-1, Goodwin;** “Regenerative Physiology and Bio-Engineered Tissue Systems for Development of a Viral Vaccine Platform for Human Vaccine Development
- 2009        **US Patent 7,601,114**  
**Goodwin, T.J et al.**”Apparatus for enhancing tissue repair in mammals”
- 2008        **US Patent 7,456,019**  
**Goodwin, T. J, et al.** “Three-Dimensional Cell to Tissue Development Process”
- 2008        **MSC-24541-1,** “Electromagnetic Time Variance Magnetic Fields (TVMF) To Generate And Regrow Cartilage By A Non- Invasive Method”
- 2007        **US Patent 7,198, 947**  
**Goodwin, T.J. et al.** “Production Of Functional Proteins: Balance Of Shear Stress And Gravity ”
- 2007        **US Patent 7,179,217**  
**Goodwin, T.J. et al.** Apparatus for enhancing tissue repair in mammals
- 2006        **MSC-23981-1 PCT,** Apparatus for Enhancing Tissue Repair In Mammals
- 2006        **MSC-23983-1 PCT,** Improved Three-Dimensional Cell To Tissue Development Process
- 2006        **MSC-24164-1,** Three- Dimensionally Engineered Normal Human Bronchio-Epithelial Tissue Like Assemblies: Targets for Human Respiratory Viral Infections.
- 2005        **US Patent 6,946,246**  
**Goodwin, T.J. et al.** “ Production Of Functional Proteins: Balance Of Shear Stress And Gravity ”
- 2005        **MSC-23979,** Natively Glycosylated Mammalian Biological Molecules Produced by Electromagnetically Stimulating Living Mammalian Cell
- 2005        **MSC-23980,** Interchangeable Sleeve For Enhancing Proliferation of Cells In a Rotating Bioreactor
- 2005        **MSC-23981,** Apparatus for Enhancing Tissue Repair In Mammals
- 2005        **MSC-23982,** Apparatus For Enhancing Proliferation Of Cells In A Small-Scale Cell Culturing Container
- 2005        **MSC-23983,** Improved Three-Dimensional Cell To Tissue Development Process
- 2004        **US Patent 6, 730, 498**  
**Goodwin, T.J. et al.** “ Production Of Functional Proteins: Balance Of Shear Stress And Gravity ”
- 2004        **US Patent 6,673,597**  
Wolf, D.A. and **Goodwin, T.J.** “Growth Stimulation of Biological Cells and Tissue by Electromagnetic Fields and Uses Thereof”

## ***DISCLOSURES AND PATENTS***

---

- 2003        **MSC-23679:** “Virally Induced Cell Control via Synthetically Produced Nano-Viruses”
- 2003        **MSC-23691-1** “Modular Rotating Bioreactor”
- 2002        **US Patent, 6,485,963, B1**  
Wolf, D.A. and **Goodwin, T.J.** “Growth Stimulation of Biological Cells and Tissue by Electromagnetic Fields and Uses Thereof”
- 2000        **U.S. Patent, 6,117,674**  
**Goodwin, T. J. et al.** “Pathogen Propagation in Cultured Three-Dimensional Tissue Masses”
- 1999        **U.S. Patent, 5,962,324**  
O’Connor, K.C., **Goodwin, T. J. et al.** “Three Dimensional Optic Tissue Culture and Process”
- 1999        **U.S. Patent, 5,858,783**  
**Goodwin, T.J. et al.** “Production of normal mammalian organ culture using a medium containing MEM-alpha, Leibovitz L-15, glucose galactose fructose”
- 1998        **U.S. Patent, 5,851,816**  
**Goodwin, T.J. et al.** “Cultured High Fidelity Three-Dimensional Human Urogenital Tract Carcinomas and Process.”
- 1998        **U.S. Patent 5, 846, 807**  
**Goodwin, T.J.,** “Media compositions for three-dimensional mammalian tissue growth under microgravity culture conditions.”
- 1997        **U.S. Patent 5,637,477**  
Spaulding, G.F., **Goodwin, T.J., et al** “Recombinant Protein Production and Insect Cell Culture and Process.”
- 1997        **U.S. Patent 5,627,021**  
**Goodwin, T. J. et al.,** Multi-Cellular, “Three-Dimensional Living Mammalian Tissue.”
- 1996        **U.S. Patent 5,496,722**  
**Goodwin, T. J. et al.,** “Cultured Normal Mammalian Tissue and Process.”
- 1995        MSC-22633-1: “Electrically Potentiated Growth of Mammalian Neuronal Tissue Facilitated by Rotating Wall Vessel Culture.” (**Notice to Issue March 2001**)
- 1994        **U.S. Patent 5,308,764**  
**Goodwin, T. J. et al.,** “Multi-Cellular Three-Dimensional Living Mammalian Tissue.”
- 1993        MSC-21984-1: “Cultured Normal Mammalian Tissue and Process.” U.S. Patent Pending.
- 1992        **U.S. Patent 5,153,132**  
**Goodwin, T. J. et al.,** “Three-Dimensional Coculture Process
- 1992        MSC-22118-1: “A Process for Three-Dimensional Culture of Mammalian Cartilage”

- 1992 MSC-22120-1: "A Process for Developing High-Fidelity Three-Dimensional Tumor Models of Human Bladder Carcinoma"
- 1992 MSC-22122-1: "Horizontal Rotating-Wall Vessel Viral Propagation in *In Vitro* Human Tissue Models"
- 1990 GTSF-2: "Media Designed for Coculture in the Rotating-Wall Vessel"
- 1989 MSC-21575-1: "Biologically Active Factors Produced by Multi cellular Cocultivation"
- 1989 MSC-21653-1: GTSF-1: "A Serum-Free Medium Designed for the Space Bioreactor System"

## PUBLICATIONS

---

### Books and Chapters

- Vertrees, RA., JM Jordan, T. Solley, **TJ Goodwin\***. Tissue Culture Models *In: Basic Concepts of Molecular Pathology, Vol. 2*, TC. Allen and PT. Cagel (Eds), Springer Science and Business Media, LLC. New York, NY. 2009.
- Vertrees, RA., **TJ Goodwin\***, JM Jordan, JB Zwishenberger. Tissue Culture Models *In: Molecular Pathology Of Lung Diseases*, DS Zander, HH Popper, J Jagirdar, AK Haque, PT. Cagel and R Barrios (Eds), Springer Science and Business Media, LLC. New York, NY. 2008.

## PUBLICATIONS

---

### Scientific Articles Refereed

- Goodwin, T.J.** Tissue-like 3D Assemblies of Human Broncho-Epithelial Cells, *Medical Design Briefs*, p. 24-25, March 2010.
- Vertrees, R.A., M. McCarthy, T. Solley, V. L. Popov, J. Roaten, M. Pauley, X. Wen and **T.J. Goodwin**. "Development Of A Three-Dimensional Model Of Lung Cancer Using Cultured Transformed Lung Cells", *Cancer Biology and Therapy*, 8:4, February 2009.
- Goodwin, T.J.**, M. McCarthy, Y.H. Lin, A.M. Deatly. "Three-Dimensionally Engineered Normal Human Lung Tissue-Like Assemblies: Target Tissues for Human Respiratory Viral Infections", *NASA Technical Paper-TP-2008-214771*, March 2008.
- Vertrees, R.A., J.B., Zwishenberger, P.J.Boor, V.Popov, M. McCarthy, T.N. Solley, and **T.J. Goodwin**; "Cellular Differentiation In Three-Dimensional Lung Cell Cultures", *Cancer Biology and Therapy*, 7:3, March 2008.
- Suderman, M.T.; McCarthy, M.; Mossell, E.; Watts, D.M.; Peters, C.J.; Shope, R.; and **Goodwin, T.J.\*** "Three-Dimensional Human Bronchial-Tracheal Epithelial Tissue-Like Assemblies as Hosts For Severe Acute Respiratory Syndrome-CoV Infection", *NASA Technical Paper-TP -2006-213723*, July 2006.
- Ho"ner Kerstin zu Bentrup, Rajee Ramamurthy, C. Mark Ott, Kamal Emami, Mayra Nelman-Gonzalez, James W. Wilson, Emily G. Richter, **Thomas J. Goodwin**, Steven J. Alexander, Duane L. Pierson, Neal Pellis, Kent L. Buchanan, Cheryl A. Nickerson. "Three-dimensional organotypic models of human colonic epithelium to study the early stages of enteric salmonellosis" *Microbes and Infection*, 8 (7) 1813-25, June, 2006.

## PUBLICATIONS

---

### Scientific Articles Refereed

- Vertrees, RA, Das GC, Popov VL, Coscio AM, **Goodwin TJ**, Logrono R, Zwischenberger, JB, Boor PJ. "Synergistic interaction of hyperthermia and gemcitabine in lung cancer," *Cancer Biology and Therapy*, 1:4 (10) Oct. 2005.
- Wang Ruoxiang , Jianchun Xu, Lisa Juliette, Agapito Castilleja , John Love , Shian-Ying Sunga, Haiyen E. Zhaua, **Thomas J. Goodwin**, Leland W.K. Chung. " Three-dimensional co-culture models to study prostate cancer growth, progression, and metastasis to bone". Review: *Seminars in Cancer Biology*, (15) 353-354, 2005.
- Kleis, S.J., Trinh, Tinh, Truong T., and **Goodwin T.J.** " Fluid Dynamic Evaluation of the NASA/MMRB Automated Bioreactor Concept ", *NASA Technical Manuscript –TM-2005–213145*, August, 2005.
- Kleis, S.J.; Truong T.; and **Goodwin T.J.** "Automated Static Culture System Cell Module Mixing Protocol and Computational Fluid Dynamics Analysis", *NASA Technical Paper –TP-2004–212066*, January 2004.
- Goodwin, T.J.**, C. Lundquist, J. Tuxhorn, and K. Hurlbert. "The biotechnology facility for International Space Station". *J. Grav. Physiol.* 11(1):75-80, 2004.
- Goodwin, T.J.** Physiological and Molecular Genetic Effects of Time-Varying Electromagnetic Fields on Human Neuronal Cells, *NASA Technical Paper-TP-2003-212054*, September 2003.
- Nickerson CA, **Goodwin TJ**, Terlonge J, Ott CM, Buchanan KL, Uicker WC, Emami K, LeBlanc CL, Ramamurthy R, Clarke MS, Vanderburg CR, Hammond TG, Pierson DL. "Three-dimensional tissue assemblies: novel models for the study of Salmonella enterica serovar Typhimurium pathogenesis". *Infect Immun.*; 69(11):7106-20, Nov. 2001.
- Goodwin, T. J.**, L. Coate-Li, R.M. Linnehan, and T. G. Hammond, Selected Contribution: "A three-dimensional model for assessment of in vitro toxicity in *Balaena mysticetus* renal tissue." *J. Appl. Physiol.* 89: 2508-2517, December 2000.
- Jessup, J. M., M. Frantz, E. Sonmez, J. Locker, K. Skena, H. Waller, Paul Battle, A. Nachman, M. W. Weber, D. A. Thomas, R. L. Curbeam, T. L. Baker, and **T.J. Goodwin**, "Microgravity Culture Reduces Apoptosis and Increases the Differentiation of a Human Colorectal Carcinoma Cell Line." *In Vitro Cellular and Dev. Biol.* Vol. 36(6): 367-73, June 2000.
- TG Hammond, E. Benes, KC O'Reilly, DA Wolf, RM Linnehan, A. Taher, JH Kaysen, P. L. Allen, **TJ Goodwin** "Mechanical Culture Conditions Effect Gene Expression: Gravity induced changes on the Space Shuttle." *Physiological Genomics* 3:163-173, June 2000.
- Goodwin, T. J.**, Timothy G. Hammond, James H. Kaysen, Linda Coate-Li, Richard M. Linnehan, Todd M. O'Hara, and Thomas F. Albert "Preliminary report on the culture and metallothionein molecular analysis of tissues from subsistence harvested Bowhead (*Balaena Mysticetus*) whales: development of a model for the study of heavy metals in cetaceans." *Report to the International Whaling Commission*, May 1999.
- Goodwin TJ**, and TG Hammond. Utilizing Shear Stresses in Rotating Cell-Culture Vessels. *NASA Technical Brief MSC-22859*, 1999.
- Hammond, T.G., **T.J. Goodwin**, F.C. Lewis, R.M. Linnehan, D.A. Wolf, K.P.Hire, W.C. Campbell, E. Benes, K.C. O'Reilly, R.K. Globus, and J.H. Kaysen, Gene Expression in Space. *Nature Medicine*. Vol.5, no.4. April 1999.

## PUBLICATIONS

---

### Scientific Articles Refereed

- Kaysen, J.H., W.C. Campbell, R.R. Majewski, F.O. Goda, G.L. Navar, **T.J. Goodwin**, and T.G. Hammond. Select de novo gene and protein expression during renal epithelial cell culture in rotating wall vessels is shear stress dependent. *J. Membrane Biol.*, Vol. 168(1):77-89, 1999.
- Hammond, T.G., F.O. Goda, G.L. Navar, W.C. Campbell, R.R. Majewski, D.L. Galvan, F. Pontillon, J.H. Kaysen, **T.J. Goodwin**, S.W. Paddock, and P.J. Verroust. Membrane potential mediates H<sup>+</sup>-ATPase dependence of “degradative pathway” endosomal fusion. *J. Membrane Biol.*, Vol. 162:157-167, 1998.
- Lelkes, P.I., D.L. Galvan, G.T. Hayman, **T.J. Goodwin**, D.Y. Chatman, S. Cherian, R.M.G. Garcia, and B. Unsworth. Simulated microgravity conditions enhance differentiation of cultured PC12 cells towards the neuroendocrine phenotype. *In Vitro Cellular & Dev. Biol.*, Vol. 34:316-325, March, 1998.
- Ingram, M., G.B. Techy, R. Saroufeem, O. Yazan, K.S. Narayan, **T.J. Goodwin**, and G.F. Spaulding. Three dimensional growth patterns of various human tumor cell lines in simulated microgravity of a NASA bioreactor. *In Vitro Cellular & Dev. Biol.*, 33(6):459-466, June 1997.
- Zhau, H.E., **T.J. Goodwin**, S-M Chang, T.L. Baker, and L.W.K. Chung. Establishment of a 3-dimensional human prostate organoid co-culture under microgravity-simulated conditions: Evaluation of androgen-induced growth and PSA expression. *In Vitro Cellular & Dev. Biol.*, 33(5):375-380, May 1997.
- Baker, T.L. and **T.J. Goodwin**. Three-dimensional culture of bovine chondrocytes in rotating-wall vessels. *In Vitro Cellular & Dev. Biol.*, 33(5):358-365, May 1997.
- Pellis, N.R., **T.J. Goodwin**, D. Risin, B.W. McIntyre, R.P. Pizzini, D. Cooper, T.L. Prewett, and G.F. Spaulding. Changes in gravity inhibit lymphocyte locomotion through type I collagen. *In Vitro Cellular & Dev. Biol.*, 33(5):398-405, May 1997.
- Jessup, J.M., D. Brown, W. Fitzgerald, R.D. Ford, A. Nachman, **T.J. Goodwin**, and G. Spaulding. Induction of carcinoembryonic antigen expression in a three-dimensional culture system. *In Vitro Cellular & Dev. Biol.*, 33(5):352-357, May 1997.
- Lelkes, P.I., E. Ramos, V.V. Nikolaychik, D.M. Wankowski, B.R. Unsworth, and **T.J. Goodwin**. GTSF-2: A new, versatile cell culture medium for diverse normal and transformed mammalian cells. *In Vitro Cellular & Dev. Biol.*, 33(5):344-351, May 1997.
- Goodwin, T.J.**, T.L. Prewett, G.F. Spaulding, and J.L. Becker. Three-dimensional culture of a mixed mullerian tumor of the ovary: expression of in vivo characteristics. *In Vitro Cellular & Dev. Biol.*, 33(5):366-374, May 1997.
- Spaulding, G.F., T.L. Prewett, and **T.J. Goodwin**. Growing bladder cancer cells in three-dimensional clusters. *NASA Tech. Brief*, Vol. 19, No. 12, p.26, Dec. 1995
- Wolf, D.A. and **T.J. Goodwin**. Growing three-dimensional cocultures of cells. *NASA Tech. Brief*, Vol. 19, No. 5, p. 94, May 1995.
- Wolf, D.A., G.F. Spaulding, T.L. Prewett, and **T.J. Goodwin**. Three-dimensional cocultures of human small intestine cells. *NASA Tech. Brief.*, Vol. 18, No. 1, p. 68, Jan. 1994.
- Jessup, J.M., K. Brown, S. Ishii, R. Ford, G. **T. J. Goodwin**, and G. Spaulding. Simulated microgravity does not alter epithelial cell adhesion to matrix and other molecules. *Advances in Space Research* 14, 1994.

## PUBLICATIONS

---

### Scientific Articles Refereed

- Becker, J.L., T. L. Prewett, G. F. Spaulding, and **T. J. Goodwin**. Three Dimensional Growth and Differentiation of Ovarian Tumor Cell Line in High Aspect Rotating-Wall Vessel: Morphologic and Embryologic Considerations. *Journal of Cellular Biochemistry* 51, 1993.
- Goodwin, T.J.**, T. L. Prewett, D. A. Wolf, and G. F. Spaulding. Reduced Shear Stress: A Major Component in the Ability of Mammalian Tissues to Form 3-Dimensional Assemblies in Simulated Microgravity. *Journal of Cellular Biochemistry* 51, 1993.
- Jessup, J.M., **T.J. Goodwin**, and G. F. Spaulding. Prospects for Use of Microgravity-Based Bioreactors to Study Three-Dimensional Host-Tumor Interactions in Human Neoplasia. *Journal of Cellular Biochemistry* 51, 1993.
- Spaulding, G.F., J. M. Jessup, and **T. J. Goodwin**. Advances in Cellular Construction. *Journal of Cellular Biochemistry* 51, 1993.
- Goodwin, T.J.**, W.F. Schroeder, D.A. Wolf, and M.P. Moyer. Coculture of Normal Human Small Intestine Cells in a Rotating-Wall Vessel Culture System. *Proceedings of the Society for Experimental Biology and Medicine* Vol. 202, Feb. 1993.
- Prewett, T.L., **T.J. Goodwin**, and G.F. Spaulding. Three-Dimensional Modeling of T-24 Human Bladder Carcinoma Cell Line: A New Simulated Microgravity Vessel. *Journal of Tissue Culture Methods*, Jan. 1993.
- Schwarz, R.P., **T.J. Goodwin**, and D.A. Wolf. Cell Culture for Three-Dimensional Modeling in Rotating-Wall Vessels: An Application of Microgravity. *Journal of Tissue Culture Methods* 14:2 51-58, April 1992.
- Tsao, Y.D., **T.J. Goodwin**, D.A. Wolf, and G.F. Spaulding. Responses of Gravity Level Variations on the NASA/JSC Bioreactor System. *The Physiologist* 35:1 49-50, Feb. 1992.
- Goodwin, T.J.**, J.M. Jessup, and D.A. Wolf. Morphological Differentiation of Colon Carcinoma Cell Lines HT-29 and HT-29KM in Rotating-Wall Vessels. *In Vitro Cellular and Developmental Biology* 28A 47-60, Jan. 1992.
- Goodwin, T.J.**, J.M. Jessup, C.F. Sams, and D.A. Wolf. In Vitro Three-Dimensional Tissue Modeling. JSC Research and Technology Report 1988, NASA Technical Memorandum 100 473, March 1989.
- Rutzky, L.P., **T.J. Goodwin**, S.J. LeGrue, and B.D. Kahan. Monoclonal Antibody Defined Human Colon Tumor-Associated Antigen. *Proc. Amer. Soc. Cancer Res.* 26:296, 1985.
- Rutzky, L.P., **T.J. Goodwin**, J. Sengupta, B.D. Kahan, and B.H. Tom. Liposome-Mediated Immunogenicity of Human Colon Tumor Antigens. *Fed. Proc.* 41:791, 1982.
- Tom, B.H., **T.J. Goodwin**, J. Sengupta, B.D. Kahan, and L.P. Rutzky. A New Approach for the Immunogenic Presentation of Membrane-Bound Human Colon Tumor Antigens. *J. Immunol. Comm.* 11:315-323, 1982.

## ABSTRACTS

---

- Goodwin, T.J.**, Schneider, S.I., Gibbons, T.F., MacIntosh, V.H., "Next Generation Respiratory Viral Vaccine System: Advanced & Emerging Bioengineered Human Lung Epithelia Model (HLEM) Organoid Technology, *13<sup>th</sup> Annual Force Health Protection Conference*, August 9-13, 2010
- Y-H. Lin, L.Z. Miller, W. Chen, D. Cooper, M. McCarthy, **T.J. Goodwin**, R.M. Hendry, D.K. Clarke, J.H. Eldridge, S.A. Udem, and A.M. Deatly. Wild Type VSV Evades Antiviral Responses of 3D Normal Human Neural Progenitor Cells. (Abst.) *Negative Strand Virology 13<sup>th</sup> International Conference*, June 17-22 2006.
- W. Chen, Y-H. Lin, L. Z Miller, B. Nowak, L. Boutilier, K. Melville, R.L. Lerch, C. Parks, M. McCarthy, **T.J. Goodwin**, G.E. Hancock, N. Terio, T. Chen, M. Elliott, H. Arendt, J. Obregon, J. DeStefano, S.A. Udem, J.H. Eldridge, and A.M. Deatly. Humanized Bovine PIV3 Viruses Encoding RSV Glycoproteins are Attenuate n a 3D Model of Human Respiratory Epithelium. (Abst.) *American Society for Virology 25<sup>th</sup> Annual Meeting*, July 15-19 2006.
- L.Z. Miller, Y-H. Lin, W. Chen, M. McCarthy, **T.J. Goodwin**, R.M. Hendry, D.K. Clarke, J.E. Johnson, F. NASAr, M. Lee, S. Heron, S.A. Udem, J.H. Eldridge, and A.M. Deatly. Development of a Novel 3D Model of Human Neural Progenitor Cells to Identify Biomarkers of Vesicular Stomatitis Virus Induced Neurovirulence. (Abst.) *American Society for Virology 25<sup>th</sup> Annual Meeting*, July 15-19 2006.
- Goodwin, T.J.**, M.A. McCarthy, R.G. Dennis. Physiological And Molecular Genetic Effects Of Time Varying Electromagnetic Fields (TVEMF) On Human Neuronal Cells. *Medicine and Science in Sports and Exercise*, Vol. 37:5 Suppl. 2005.
- Suderman, M.T., E. Mossel, D.M. Watts, C.J. Peters, M. A. McCarthy, R.E. Shope, **T.J. Goodwin**. Severe Acute Respiratory Syndrome (SARS)-CoV Infection in a Three-Dimensional Human Bronchial-Tracheal (HBTE) Tissue-Like Assembly. (Abst.) *American Society for Virology 23<sup>rd</sup> Annual Meeting*, July 10-14 2004.
- Goodwin, T.J.**, A.M. Deatly, M.T. Suderman, Y.H. Lin, W. Chen, C.K. Gupta, V.B. Randolph, S.A. Udem. Three-Dimensional Engineered nHigh Fidelity Normal Human Lung Tissue-Like Assemblies (TLA) As Targets for Human Respiratory Virus Infection. (Abst.) *American Society for Virology 22<sup>rd</sup> Annual Meeting*, July 12-16 2003.
- Hammond, T.G., **T.J. Goodwin**, G.L. Navar, F.O. Goda, W.C. Campbell, J.R. Ostberg, P.J. Verroust, and J.H. Kaysen. Epithelial cell gene expression is shear stress responsive. *American Soc. of Cell Biol.* 1998.
- Risin, D., T.L. Baker, J. Campbell-Washington, **T.J. Goodwin**, and N.R. Pellis. Expression of differentiation markers in HL-60 cells in simulated microgravity. *Proceedings of the AACR Meeting*, April 12-17, 1997, San Diego, CA, Vol 38:499 (Abst.#3345), 1997.
- Campbell-Washington, J., J.N. Craig, T. Baker, D. Risin, **T.J. Goodwin**, and N.R. Pellis. Differential display RT-PCR analysis and cloning of novel mRNAs expressed in HL-60 promyelocytic cells cultured in simulated microgravity conditions. (Abst.) *Published in the FASEB J.*, 10(6): April 1996. Presented at the ASBMB/ASIP/AII Joint Meeting, June 6-8, 1996, New Orleans, LA.
- Jessup, J.M., **T.J. Goodwin**, R. Garcia, and N.R. Pellis. STS-70: Flight of EDU-1. *NASA Symposium: Cell Culture Bioreactor and Three Dimensional Culture Studies*, World Congress on In Vitro Biology, June 25, 1996, San Francisco, CA.
- Pellis, N.R., **T.J. Goodwin**, J. Campbell-Washington, D. Risin, R. Pizzini, D. Morrison, and S. Gonda. *NASA Symposium: Cell Culture Bioreactor and Three Dimensional Culture Studies*, World Congress on In Vitro Biology, June 25, 1996, San Francisco, CA.

*ABSTRACTS continued*

---

- Hammond, T.G., D.L. Galvin, **T.J. Goodwin**, and P.I. Lelkes. Human renal epithelial cells in culture differentiate under simulated microgravity. *In Vitro Cellular and Developmental Biology*, Vol. 31 No.3 Part II, p.9A, 1995.
- Galvan, D.L., B.R. Unsworth, **T.J. Goodwin**, J. Liu, and P.I. Lelkes. Microgravity enhances tissue-specific neuroendocrine differentiation in cocultures of rat adrenal medullary parenchymal and endothelial cells. *In Vitro Cellular and Developmental Biology*, Vol. 31 No. 3 Part II, p.10A, 1995.
- Lelkes, P.I., J. Liu, D. Wanakowski, D. Galvan, B. Unsworth, and **T. Goodwin**. Simulated microgravity conditions enhance neuroendocrine organoid formation in vitro. American Institute of Aeronautics and Astronautics (AIAA), Life Sciences and Space Medicine Conference and Exhibition '95, Houston, Texas April 3-5, 1995.
- Fitzgerald, W., J.N. Craig, G.F. Spaulding, J.M. Jessup, and **T.J. Goodwin**. Expression of carcinoembryonic antigen in MIP101 colon carcinoma cells in rotating wall vessel culture. *Molecular Biology of the Cell*, Vol. 5, Suppl., 1994.
- Goodwin, T.J.**, T.L. Prewett, D. Risin, D.L. Pierson, and M.L. Jones. Differentiation of HL-60 Cells in Rotating-Wall Vessels: Induction by Simulated Microgravity. *Molecular Biology of the Cell*, Vol.5, Suppl. p481a, 1994.
- Goodwin, T.J.**, and G.F. Spaulding, Mammalian Cell Culture in the NASA Bioreactor. Society for Industrial Microbiology, 1994.
- Pellis, N.R., **T.J. Goodwin**, D. Risin, B.W. McIntyre, R.P. Pizzini, D. Cooper, T.L. Prewett, G.F. Spaulding. Human Lymphocyte Locomotion in Randomize Gravity. *In Vitro Cellular and Developmental Biology*, Vol. 30A No.3 Part II, 1994.
- Chung, L.W.K., **T.J. Goodwin**, H.Y.E. Zhau, T.L. Prewett, and G.F. Spaulding. Microgravity Affects Human Prostate Cancer Growth and Differentiation: A Preliminary Report. *In Vitro Cellular and Developmental Biology*, Vol. 30A No.3 Part II, 1994.
- Becker, J.L., T.L. Prewett, **T.J. Goodwin**, G.F. Spaulding. Growth and Gene Expression in Human Ovarian Cancer. *In Vitro Cellular and Developmental Biology*, Vol.1 30A No.3 Part II, 1994.
- Jessup, J.M., W. Fitzgerald, J. Polanec, R. Ford, **T.J. Goodwin**, G.F. Spaulding, D. Brown. CEA Production in Human Colon Cancer. *In Vitro Cellular and Developmental Biology*, Vol.1 30A No.3 Part II, 1994.
- Levine, E.M., **T.J. Goodwin**, T.L. Prewett, and G.F. Spaulding. Cultured Human Endothelial and Smooth Muscle Cells. *In Vitro Cellular and Developmental Biology*, Vol. 30A No.3 Part II, 1994.
- Prewett, T.L., and **T.J. Goodwin**. Three-Dimensional Culture of Bovine Chondrocytes in Rotating-Wall Vessels. *In Vitro Cellular and Developmental Biology*, Vol 30A No.3 Part II, 1994.
- Goodwin, T.J.**, T.L. Prewett, G.F. Spaulding, R.H. Widen, and J.L. Becker. A Model for Culture of Primary Breast Carcinoma Tissues in Rotating Wall Vessels (RWV). Thirty-third American Society for Cell Biology Annual Meeting. Submitted.
- Francis, K., K. O'Connor, T. Prewett, **T.J. Goodwin**, and G.F. Spaulding. The NASA High-Aspect Ratio Vessel (HARV): A Novel Bioreactor for Insect-Cell Cultivation. The 6th Annual Meeting of Japanese Association for Animal Cell Technology. Submitted.

*ABSTRACTS continued*

---

- Becker, J.L., T.L. Prewett, **T.J. Goodwin**, and G. F. Spaulding. Simulated Microgravity Model of Ovarian Tumor Growth. 24th AIAA Conference on Life Sciences and Systems. September 21-23, 1993 (Abst.93-4100).
- Edwards, M.L., M. Uthman, G. Spaulding, **T.J. Goodwin**, and A. Holian. Type II Pneumocytes Retain Differentiated Morphology in a Low-Shear Suspension Culture. American Thoracic Society.
- Jessup, J.M. and **T. J. Goodwin**. Simulated Microgravity Improves Production of Colonic Growth Factors. 24th AIAA Conference on Life Sciences and Systems. September 21-23, 1993 (Abst.93-4098).
- Francis, K.M., K. O'Connor, A.D. Andrews, G.F.Spaulding, and **T.J. Goodwin**. Growth, Metabolic Activity and Recombinant Protein Expression for Fall Armyworm Ovary Cells Cultured in the NASA High-Aspect Ratio Vessel. AIAA Conference on Space Programs and Technologies. September 21-23, 1993 (Abst.93-4099).
- Goodwin, T.J.**, N. R. Pellis, D. Risin, and G. F. Spaulding. Inhibition of Normal Human Peripheral Blood Lymphocyte Locomotion through Collagen Matrix in Simulated Microgravity. *Molecular Biology of the Cell*, 3S 361A, Sept. 1992.
- Prewett, T.L., J. Becker, G. F. Spaulding, and **T. J. Goodwin**. Morphological and Immunohistochemical Analysis of LN1 Ovarian Tumor Cell Line Grown in Rotating-Wall Vessels. *Molecular Biology of the Cell*, 3S 23A, Sept. 1992.
- Jessup, J.M., K. Brown, S. Ishii, R. Ford, **T.J. Goodwin**, and G.F. Spaulding. Simulated Microgravity Does Not Alter Epithelial Cell Adhesion to Matrix and Other Molecules. *Molecular Biology of the Cell*, 3S 71A, Sept. 1992.
- Goodwin, T.J.**, W.F. Schroeder, D.A. Wolf, and M.P. Moyer. Coculture of Normal Human Small Intestine Cells in a Rotating-Wall Vessel Culture System. *In Vitro Cellular and Developmental Biology* 28:3 153A, March 1992.
- Prewett, T.L., **T.J. Goodwin**, R.P. Schwarz, and G.F. Spaulding. Three-Dimensional Modeling of T-24 Human Bladder Carcinoma Cell Line: A New Simulated Microgravity Vessel. *In Vitro Cellular and Developmental Biology* 28:3 161A, March 1992.
- Goodwin, T.J.**, D.A. Wolf, J.H. Cross, and C.F. Sams. Reduction of Lysozyme Expression in HT-29KM Grown in a Three-Dimensional Culture System in Glucose Medium. *In Vitro Cellular and Developmental Biology* 26:48A, 1990.
- Moyer, M.P., A.L. Culpepper, J.W. Egan, T.L. Johnson, **T.J. Goodwin**, C.F. Sams, and S. Gonda. Human Cells Cultured in Simulated Microgravity. *In Vitro Cellular and Developmental Biology* 26:40A, 1990.
- Goodwin, T.J.**, D.A. Wolf, C.F. Sams, C.D. Bucana, J.M. Jessup, and N.M. Cintron. Differentiation of HT-29 and HT-29KM in a Three-Dimensional Culture System in Glucose Medium. *In Vitro Cellular and Developmental Biology* 25:20A, 1989.
- Jessup, J.M., **T.J. Goodwin**, C.D. Bucana, C.F. Sams, and D.A. Wolf. Matrix Association Culture System (MACS): A New Three-Dimensional Culture System for Growth Factor Analysis. *The Journal of Cell Biology* 107:1441, 1989.
- Rutzky, L.P., **T.J. Goodwin**, S.J. LeGrue, and B.D. Kahan. Colon Tumor-Associated Antigen Defined by a Monoclonal Antibody. *In Vitro Cellular and Developmental Biology* 21:28A, 1985.

*ABSTRACTS continued*

---

- Rutzky, L.P., **T.J. Goodwin**, and B.D. Kahan. Human Colon Tumor Cell Line Antigen Defined by a Monoclonal Antibody. Proc. Amer. Soc. Cancer Res. 25:253, 1984.
- Goodwin, T.J.**, N.R. Pellis, D. Risin, G.F. Spaulding. Inhibition of Normal Human Peripheral Blood Lymphocyte Locomotion Through Collagen Matrix in Simulated Microgravity. American Society for Cell Biology Annual Meeting, Denver, CO, November, 1992
- Jessup, J.M., K. Brown, S. Ishii, R. Ford, **T.J. Goodwin**, G.F. Spaulding. Simulated Microgravity Does Not Alter Epithelial Cell Adhesion to Matrix and Other Molecules. American Society for Cell Biology Annual Meeting, Denver, CO, November, 1992
- Prewett, T.L., **T.J. Goodwin**, G.F. Spaulding, J.L. Becker. Morphological and Immunohistochemical Analysis of LN1 Ovarian Tumor Cell Line Grown in Rotating-Wall Vessels. American Society for Cell Biology Annual Meeting, Denver, CO, November, 1992.
- Jessup, J.M., R. Ford, G. Spaulding, and **T.J. Goodwin**. Use of Microgravity Emulation to Test the Function of Three-Dimensional Human Colon Carcinoma Cell Cultures. COSPAR Meeting, Washington, DC, August, 1992
- Jessup, J.M., R. Ford, **T.J. Goodwin**, and G. Spaulding. "Effect of Simulated Microgravity on Human Epithelial Cell Association and Recognition" Aerospace Medical Association Meeting, Miami, FL, May, 1992.
- Goodwin, T.J.**, D.A. Wolf, J.H. Cross, and C.F. Sams. Reduction of Lysozyme Expression in HT-29KM Grown in a Three-Dimensional Culture System in Glucose Medium. Tissue Culture Meeting, Houston, TX, June 10-13, 1990.
- Weinstein, R.S., J.R. Kuszak, C.F. Sams, **T.J. Goodwin**, W. Knudson, and S.R. Gonda. Morphogenesis in Simulated Microgravity. Epithelial-Stromal Interactions Between HT-29 Colon Adenocarcinoma Cells and Normal Fibroblasts in Low Shear Culture. American Society for Cell Biology, Houston, TX, November 5-9, 1989.
- Goodwin, T.J.**, D.A. Wolf, C.F. Sams, C.D. Bucana, J.M. Jessup, and N.M. Cintron. Differentiation of HT-29 and HT-29KM in a Three-Dimensional Culture System in Glucose Medium. Tissue Culture Association Meeting, Orlando, FL, June 11-14, 1989.
- Jessup, J.M., **T.J. Goodwin**, C.D. Bucana, C.F. Sams, and D.A. Wolf. Rotating-Wall Vessels (RWVs) Simulate Some Aspects of Microgravity and Permit Expression of Differentiation of Colon Carcinoma. Aerospace Medical Association Meeting, Washington, DC, May 7-11, 1989.
- Wolf, D.A., R.P. Schwarz, M.L. Lewis, **T.J. Goodwin**, J.H. Cross, C.F. Sams, and J.M. Jessup. Three-Dimensional Growth of Cells in Rotating Culture Systems. Aerospace Medical Association Meeting, Washington, DC, May 7-11, 1989.
- Lewis, M.L., W.H. Bowie, R.P. Schwarz, J.H. Cross, **T.J. Goodwin**, D.A. Wolf, and C.F. Sams. Culture of Cells in Zero-Headspace Rotating-Wall Bioreactors. Federation of American Societies for Experimental Biology, Las Vegas, NV, May 1-5, 1988.
- Lewis, M.L., W.H. Bowie, R.P. Schwarz, J.H. Cross, **T.J. Goodwin**, C. D. Anderson, and D.A. Wolf. Culture of Anchorage-Dependant Cells in Zero-Headspace Bioreactors. American Society for Gravitational and Space Biology, Annual Meeting, Logan, UT, October 18-21, 1987

## INVITED PRESENTATIONS

---

- BioConference/Labroots “Bio-Engineered Regenerative Technology To Study Human Lung Viral Infections” - PACE Course 538-107-10, Oct. 2010
- Next Generation Sub Orbital Researchers Conference “Three Dimensional Human Tissues as Surrogates for Suborbital & Orbital Research into Human Cellular Genomics, Proteomics, and Metabolomic Tissue Responses During Transitional Space Flight” Feb.2010
- Sputnik Observatory Interview [http://blog.sptnk.org/2009/07/  
http://sptnk.org/index.html#/person/220/conversations/?&off=0&lim=16](http://blog.sptnk.org/2009/07/http://sptnk.org/index.html#/person/220/conversations/?&off=0&lim=16)
- The Feist-Weiller Cancer Center’s Spring 2007 Seminar Series, “Three Dimensional Oncology Models: Tissue Engineering Systems for Improved Cancer Treatment” Shreveport LA., February 6, 2007.
- Society of Industrial Microbiology Three-Dimensionally Engineered Normal Human Broncho-epithelial Tissue-Like Assemblies: Target Tissues for Human Respiratory Viral Infections. Annual Meeting, Baltimore MD., July 30, 2006.
- Grand Rounds at University of Washington, Dept of Neurosurgery. *Tissue Engineering/Molecular Genetics and Cellular Regeneration Using TVEMF*, April 12, 2006

## FUNDING FOR 13-YEAR PERIOD (2000-2013)

---

### **Innovation CIF Research Grant**

**PI:** Thomas J. Goodwin, Ph.D

**Study Title:** “Development of the NTReS System”

**Years FY2010-2011**

**NIH-PO1 AG032958-01- PI- Gilden, Donald H., MD.**

**Co-I Thomas J. Goodwin, Ph.D.**

**Study Title:** “The Molecular Pathogenesis of Varicella Zoster Virus Infection”

**Years- 2009-2013**

### **Innovation Partnership Program**

**NASA PI: Thomas J. Goodwin, Ph.D.**

**Study Title:** “Ambient-Stable Thioaptamer Assays to Survey Human Biological Samples for Research and Medical Markers of Disease and Trauma” Physician Point-of-Care.

FY2009

**NASA PI: Thomas J. Goodwin, Ph.D.**

**Study Title:** “Ambient-Stable Thioaptamer Assays to Survey Human Biological Samples for Research and Medical Markers of Disease and Trauma” Physician Point-of-Care.

FY2008

### **Reimbursable Space Act Agreements (Commercial Sponsored Research Agreements)**

#### **Reimbursable Space Act Agreement Orthofix Inc.**

**PI: Thomas J. Goodwin, Ph.D.**

Research Covers Analyses, Development and Exposure Of Human Cells To PEMF To Bone Cartilage And Vascular Tissue

Funded Two Year Extension 2008-2010

**Reimbursable Space Act Agreement Orthofix Inc.**

PI: **Thomas J. Goodwin, Ph.D.**

Research Covers *Analyses, Development and Exposure Of Human Cells To PEMF To Bone Cartilage And Vascular Tissue*

Funded Two Years 2007-2008

**Reimbursable Space Act Agreement Regenetech Inc.**

PI: **Thomas J. Goodwin, Ph.D.**

Research covers the *expansion and implementation of Adult Stem Cells to regenerate including, but not limited to, human liver, skin, prostate, cartilage, and pancreas.*

Funded Four years 2003-2005

**Reimbursable Space Act Agreement Wyeth Vaccines**

PI **Thomas J. Goodwin, Ph.D.**

Wyeth PI Anne Deatly, Ph.D.

Research Covers *Development of clinically relevant models of human lung and neural tissue to accomplish predictive applications and new vaccine development*

Funded Four years 2001-2005

**NASA-Johnson Space Center - Center Director's Discretionary Fund Grants:**

*“Electrically Potentiated Growth of Mammalian Neuronal Tissues Facilitated by Rotating-Wall Vessel Culture”* - Funded for 4 years starting 1998-2001.

**Principal Investigator: Thomas J. Goodwin, Ph.D.**

*“Development of an Immune Monitoring Strategy to Reflect Toxicological Insult: A Study in Marine Mammal Physiology Facilitated by Rotating-Wall Vessel Culture”* - Funded for 4 years starting 1998-2001.

Principal Investigator: Richard M. Linnehan, D.V.M., Astronaut Office;

Co- Principal Investigator: **Thomas J. Goodwin, Ph.D.** 1998-2001

**NRA Research Announcement (NRA) 00-HEDS-03**

*“ Molecular Basis of Salmonella Enteropathogenesis”* ,

Principal Investigator: Cheryl Nickerson, Ph.D.: Tulane University Medical School,

Funded for 3 years 2001-2004

**Co-investigator Thomas J. Goodwin, M.A**

**NRA Research Announcement (NRA) 00-HEDS-03**

*“Transcription Factors Mediating Rotating Wall Vessel Induced Gene Expression Changes”*

Principal Investigator: Timothy G. Hammond M.D., Tulane University Medical School,

Funded for 3 years 2001-2004,

**Co-Investigator Thomas J. Goodwin, M.A**

## **PROGRAM BRIEFINGS**

---

The Honorable George Brown, U.S. House of Representatives, CA; May, 1992

Supported the Space Station Briefing presented to Committee Chairman Richard Durbin, U.S. House of Representatives, IN; May, 1992

Supported the Space Station Briefing presented to the U.S. House of Representatives Space Subcommittee. Present were members of the Texas Delegation including Ralph Hall, Rockwall, TX; Jim Chapman, Sulphur Springs, TX; Mike Andrews, Houston, TX; Tom Delay, Houston (Clear Lake City), TX and others. Testimony was presented by Texas Governor Ann Richards; Dr. Michael DeBakey, chancellor of Baylor College of Medicine; and Dr. Charles LeMaistre, president of M.D. Anderson Cancer Center.

## **NATIONAL ARTICLES**

---

“Prostate Modeling Experiment Success Becomes Part of Legacy of Shuttle Astronauts” *Journal of the National Cancer Institute*, Vol. 95, No. 7, 505-507, April 2, 2003.

<http://jnci.oxfordjournals.org/cgi/content/full/95/7/505>

“Genes in Microgravity” *Discover Magazine*, September 01, 2001 <http://discovermagazine.com/2001/sep/featgenes>

“Microgravity and Gene Expression: Early Results Point to Relationship” *The Scientist*, Vol. 13, No. 18, September 13, 1999 [http://www.the-scientist.com/yr1999/nov/research\\_991122.html](http://www.the-scientist.com/yr1999/nov/research_991122.html)

“New Horizons for Stem Cell Bioreactors.” *Biotechnology*, Vol. 10, October 1992

“NASA Ready to Attempt Human Cell Growth in Space.” *Aviation Week and Space Technology*, July 6, 1992

“NASA/JSC Inventor of the Year.” *NASA Tech Briefs*, Vol. 16, No. 3, March 1992

“Shear Bliss.” *Scientific American*, February 1992

“NASA Completes Tissue Model in a Microgravity Bioreactor” by Patricia Dimond. *Genetic Engineering News*, April 1991

“NASA Allies Tout Biomedical Spinoffs.” *Journal of NIH Research*, Vol. 3, December 1991

## **ADDITIONAL RESEARCH ACTIVITIES**

---

Adjunct Scientist Southwest National Primate Research Center (SNPRC) San Antonio, Texas 2009-present

Visiting Scientist, U.S. Department of Wildlife Management Arctic Research Facility, North Slope Borough, Barrow, AK., 1996-2000.

## ***SPACE SHUTTLE and ISS FLIGHT EXPERIMENTS***

---

STS-44: DSO-316, Successful flight in November, 1991  
Principal Investigator: Glenn F. Spaulding, M.D.  
Co-Investigator: Y. David Tsao, Ph.D.

STS-54: DSO-316A, Scheduled flight in January, 1993  
Principal Investigator: Neal R. Pellis, Ph.D.  
Co-Investigators: **Thomas J. Goodwin, M.A.**  
Glenn F. Spaulding, M.D.

STS-56: DSO-322, Scheduled flight in April, 1993  
Principal Investigator: Glenn F. Spaulding, M.D.  
Co-Investigators: **Thomas J. Goodwin, M.A.**  
Y. David Tsao, Ph.D.

STS-57: ASPECS Payload, Scheduled flight in June, 1993  
Principal Investigator: Glenn F. Spaulding, M.D.  
Co-Investigator: **Thomas J. Goodwin, M.A.**

STS-62: BDS; BSTC Payload, Scheduled flight in January 1994  
Principal Investigator : **Thomas J. Goodwin, M.A.**

STS-70: BDS, EDU #1 Payload, Scheduled Flight in July 1995  
Principal Investigator Phase I - J. Milburn Jessup, M.D. and NASA Tech. Manager, **Thomas J. Goodwin, M.A.**  
Principal Investigator Phase II - Stanley Kleis, Ph.D. and NASA Tech. Monitor, Rafael Garcia

STS-79/Mir3:BTS/CART, Bovine cartilage, Scheduled Flight September 1996  
Principal Investigator - Lisa E. Freed, M.D., Ph.D. and NASA Tech. Manager, **Thomas J. Goodwin, M.A.**

STS-85:EDU-1R, Scheduled Flight August 7, 1997  
Principal Investigator - J. Milburn Jessup, M.D. and NASA Tech. Manager, **Thomas J. Goodwin, M.A.**

STS-86/Mir6:Bio-3D, Scheduled Flight September 25, 1997  
Principal Investigators - T.G. Hammond, **T. J. Goodwin M.A.** , P.I. Lelkes.

## ***SPACE SHUTTLE and ISS FLIGHT EXPERIMENTS (continued)***

---

STS-89Mir7:BTS/Co-Cult, Scheduled Flight January 22, 1998  
Co-Principal Investigators - Elliot Levine, M.D., and NASA **Thomas J. Goodwin, M.A.**

STS-90 *Neurolab* : BSTC, May 1998  
Principle Investigators- T.G. Hammond, J.Kaysen, **T.J. Goodwin M.A.**

STS-106 P6 Truss and Array Mission: CGBA Molecular Genetics In Space September 2000  
Principle Investigators: T.G. Hammond and **T. J. Goodwin, M. A.**

STS-105 Cellular Biotechnology Operating System (CBOSS) **Thomas J. Goodwin, PhD, Project Manager/Scientist**

STS-108 Cellular Biotechnology Operating System (CBOSS) **Thomas J. Goodwin, PhD, Project Manager/Scientist**

STS-110/8A First Freezer System, ARCTIC #1, To Space Station for preservation of biological samples  
**Thomas J. Goodwin, PhD, Project Manager/ Scientist**

STS-111/UF-2 First Freezer System, ARCTIC #2, To Space Station for preservation of biological samples  
**Thomas J. Goodwin, PhD Project Manager/ Scientist**

STS-111/UF-2 Commercial Payload Experiment StelSys for the study of Human Liver Toxicity in Space  
**Thomas J. Goodwin, PhD Project Manager/ Scientist**

STS-107 *Space Hab Mission for Human Health*- Prostate Carcinoma Experiment –BDS-05, January 2003  
PI: Leland W. Chung, Ph.D. Co- I and Project Scientist/ Manager: **Thomas J. Goodwin, Ph.D.**