

## T R O Y D . D R E W R Y

PRODUCT DEVELOPMENT & ENGINEERING / MEDICAL DEVICE EXPERT WITNESS

### EDUCATION

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**Masters of Engineering Management**, Christian Brothers University, Memphis, TN

**Masters of Biomedical Engineering**, University of Memphis, Memphis, TN

**Bachelor of Science in Mechanical Engineering, CAD/CAM Option**, University of Southwestern Louisiana, Lafayette, LA

### PROFESSIONAL EXPERIENCE

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**2017 – Present Ragin Cajun Consulting LLC, Memphis, TN**

*Founder & Principal Engineer*

RCC is a product development consulting firm helping innovators and inventors take their ideas from concept to commercialization. Services provided include but are not limited to:

- ◆ Project Management
- ◆ Engineering Design and Development
- ◆ Design Control and DHF Management
- ◆ Intellectual Property Landscape and Analysis
- ◆ Forensic Engineering & Expert Witness Services including Medical Devices

**2013 – Present Christian Brothers University, Memphis, TN**

*Adjunct Professor – MBA Program*

Currently teaching a three-course Project Management Certification program within the Masters of Business Administration Degree Program and a course in the Healthcare MBA Program.

- ◆ **PMGT 681** – Project Management
- ◆ **PMGT 682** – Project Management, Organization, Planning, and Leadership
- ◆ **PMGT 683** – Project Analysis and Control
- ◆ **HMBA 613** – Supply Chain Management and Project Management in Healthcare Systems

**2017 – Present AgInnovation Development Group, Memphis, TN**

*Startup Mentor*

Mentor for agriculture based startup companies

**2012 – 2017 MB Innovations, Inc., Memphis, TN**

*President & COO*

MB Innovations, Inc. ("MBI") is a medical technology development and manufacturing company, providing research, design and development services for established firms on a fee-for-service basis. MBI also creates and manufactures its own technologies and intellectual property to be the basis for new venture formation and job creation. MBI's presence in Memphis utilizes the region's workplace and logistics advantages in the medical device field, especially the musculoskeletal disease sector. The proximity to Memphis-based research and development capabilities is an important strategic advantage. MBI's team of accomplished engineers and surgeon advisors accelerates the time to market through a focused approach to product development.

- 2014 – 2017**      **View Medical, Memphis, TN**  
**CEO**  
View Medical is an intraoperative lighting technology company and a recent graduate of the ZeroTo510 Medical Device Accelerator in Memphis, TN funded by MB Venture Partners and Innova.
- 2009 – 2011**      **Paradigm Spine, LLC, Memphis, TN**  
**VP, US Operations**
- ◆ Oversight of US Manufacturing Activities and Memphis Inventory Facilities (Millstone)
  - ◆ Oversight of US R&D activities
  - ◆ Oversight of US Regulatory affairs
  - ◆ Liaison with Legal and IP on all patent activities
  - ◆ Liaison with Marketing and Field Operations on all publication activities
  - ◆ Liaison with Paradigm Spine GmbH on all quality activities
  - ◆ Contributed to all US Clinical & Regulatory Affairs, including clinical study enrollments & PMA filings
- 2008 – 2009**      **Active Implants Corporation, Memphis, TN**  
**Chief Operating Officer**
- ◆ Successfully closed \$10M C-Round of funding in April 2009
  - ◆ Exceeded 2008 revenue projection for TriboFit® Acetabular Buffer system - \$1M in sales
  - ◆ Worked alongside CEO and CFO with FORTIS Bank in the Netherlands to prepare Private Placement Memorandum (PPM) and conducted Fundraising road shows in Netherlands, France, and England
  - ◆ Finalized Global Manufacturing Agreement with Joint Replacement Instrumentation Ltd in the UK for all implants
  - ◆ Set up Global Logistics Network with Fed/Ex in Eindhoven to supply our EU distributors in Italy, United Kingdom, Spain, and Germany
- 2008**              **Active Implants Corporation, Memphis, TN**  
**Vice President of Global Operations**
- ◆ Responsible for the global manufacturing and production planning for the European commercialization of the TriboFit™ Modular Hip System
  - ◆ Established, advanced, and maintained all internal and external processes and operations necessary to produce and distribute all company products
  - ◆ Developed global supply chain to support current and future product introductions
- 1995 – 2008**      **Medtronic Spinal & Biologics/Medtronic Sofamor Danek/Sofamor Danek**
- 2007 – 2008**      **Medtronic Spinal & Biologics, Memphis, TN**  
**Group Director of Product Development, Intradiscal Division**
- ◆ In May 2007 assumed responsibility for all Interbody implants (Cervical and Thoracolumbar) and an 11-member product development team
  - ◆ Oversight of \$4.2M R&D budget
  - ◆ Intradiscal products represented approximately 30% or \$550M of MS&B revenues
  - ◆ Served as General Manager for Millennium Biologics Acquisition
  - ◆ 2007 Circle of Excellence Winner for the Best Product Launch by a team – **VERTEX MAX™ Posterior Cervical Spinal System Japanese Product Introduction**
  - ◆ Responsible for driving new material platforms for intradiscal applications that included CaP bone substitutes, HA coatings, and porous PEEK
  - ◆ Led the integration of the Cervical and Thoracolumbar teams into one cohesive Product Development team

- ◆ Worked with Marketing to develop 5 to 10 year Product Pipeline to integrate new materials and biologics into the Intradiscal Product Portfolio
- 2006 – 2007 Medtronic Sofamor Danek, Memphis, TN**  
**Group Director of Product Development, Cervical /Trauma Division**
- ◆ Assumed responsibility for the Interdiscal as well as the Posterior Cervical Engineering Team
  - ◆ Managed \$2.5M R&D budget
  - ◆ Products under management represented \$250M in US revenues
  - ◆ Directed the product development efforts for the next generation **VERTEX SELECT™ Posterior Cervical Spinal System**
  - ◆ Led the development efforts for three new Cervical Interbody Implant systems
- 2004 – 2006 Medtronic Sofamor Danek, Memphis, TN**  
**Director of Product Development, Cervical /Trauma Division**
- ◆ Directed Posterior Cervical Engineering Team
  - ◆ Launched **VERTEX MAX™ Posterior Cervical Spinal System** – the number one posterior cervical spinal system in the US
  - ◆ Worked with Key Opinion Leaders to layout next generation system to accommodate **degenerative, deformity, and trauma indications**
  - ◆ Led effort to design and protect intellectual property in the field of Minimally Invasive Posterior Cervical Surgery and Dynamic Stabilization of the Cervical Spine
  - ◆ Worked with Medtronic Surgical Navigation to design and develop a system of instruments and implants to utilize image guided technologies to treat posterior cervical pathologies
  - ◆ Managed KOL consulting agreements and worked with Legal to acquire necessary license agreements and IP acquisitions as needed by the business unit
- 2003 – 2004 Medtronic Sofamor Danek, Memphis, TN**  
**Director of Product Development, Interbody/Ortho/Motion Technologies Division**
- ◆ Managed engineering team of five (5) engineers and annual product development budget of **\$2.4M**
  - ◆ Launched **first PEEK spinal implant – PEEK LT Cage™** with FDA approval via PMA supplement
  - ◆ Launched the **PEEK Verte-Stack™ Vertebral Body Spacer, PEEK Telamon™ Vertebral Body Spacer, CATALYST™ Instrument set, Modular Spreader System, HOURGLASS™ Vertebral Body Spacer, and the HYDROSORB™ family of resorbable implants**
  - ◆ Initiated a European Clinical Study comparing the **PEEK Telamon™** to the **HYDROSORB™ Telamon™** in a Posterior Lumbar Interbody Fusion (PLIF) model
  - ◆ Corporate member of the Trauma Spine Study Group that worked with spine surgeons to design and develop instruments and implants to treat spinal trauma
- 2001 – 2003 Medtronic Sofamor Danek, Memphis, TN**  
**Senior Manager, Product Development, Interbody/Ortho/Motion Technologies Division**
- ◆ Managed engineering team of five (5) engineers and annual product development budget of **\$2.4M**
  - ◆ Responsible for New Biomaterials Development Initiative to get Resorbable and PEEK polymer implants to market
  - ◆ Conducted preclinical animal studies to determine radiographic, histologic, and biomechanical performance of these new materials
  - ◆ Corporate member of the Lumbar Spine Study Group that worked with spine surgeons to promote the use of new materials in the lumbar spine
- 2000 – 2001 Medtronic Sofamor Danek, Memphis, TN**

**Manager, Product Development, Technology Development Division**

- ◆ Managed Global Product Development Team of engineers and surgeons for the **COLORADO 2™ Spinal System**
- ◆ Responsible for working with US and International KOLs to evaluate, test, and launch the system in the US with FDA approval
- ◆ Corporate member of the Spinal Deformity Study Group that worked with deformity surgeons to refine and promote the concept of Fusionless Scoliosis treatment

**1998 – 2000 Sofamor Danek, Memphis, TN**

**Senior Product Development Engineer, Technology Development Division**

- ◆ Selected to be part of new division entitled Technology Development with the mission to “develop, design, or acquire technologies and products with a targeted launch 3 to 5 years out”
- ◆ Worked with KOL Surgeons to design, develop, and patent three concepts for **Fusionless Correction of Scoliosis**
- ◆ Conducted necessary biomechanical testing and preclinical animal studies for FDA submission of Fusionless Scoliosis Systems
- ◆ Received FDA approval for the **first shape memory alloy implant** – the **SMA Staple**

**1997 – 1998 Sofamor Danek, Memphis, TN**

**Product Development Engineer, Thoracolumbar Division**

- ◆ Designed, developed, and launched the **CD Horizon™ Multi-Axial Screw System, PYRAMESH™ Surgical Titanium Mesh System, PLIF Instrument Set, and the Low Profile MULTI-SPAN™ Crosslink System**
- ◆ Maintained Design History Files per Quality System requirements and conducted pre-launch product evaluations with KOL surgeons
- ◆ Worked with Regulatory department to obtain necessary FDA approvals for launch

**1995 – 1997 Sofamor Danek, Memphis, TN**

**Associate Product Development Engineer, Thoracolumbar Division**

- ◆ Provided engineering support for the Texas Scottish Rite Hospital (TSRH™) Spinal System
- ◆ Designed and developed auxiliary instruments and implants as dictated by the surgeon customer
- ◆ Conducted implant and instrument optimization via ProEngineer CAD, ProMechanica FEA, and biomechanical testing and cadaveric evaluations

## PATENTS

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### Ranked 17<sup>th</sup> out of the Top 100 Spinal Device Inventors (1971-2003)

Source: Spinal Implant Orthopedic Intellectual Property Report  
MedicineLodge, Inc. 2003

- ◆ 55 US Issued Patents to date
  - ◆ 27 US Patent Applications pending
  - ◆ 17 Foreign Issued Patents to date
  - ◆ 33 Foreign Patent Applications pending
1. **5,728,098 – Multi-Angle Bone Screw Assembly Using Shape-Memory Technology**  
Inventors: Michael C. Sherman and Troy D. Drewry
  2. **5,782,831 – Method and Device for Spinal Deformity Reduction Using A Cable and a Cable Tensioning System**  
Inventors: Michael C. Sherman and Troy D. Drewry
  3. **5,797,911 – Multi Axial Bone Screw Assembly**  
Inventors: Michael C. Sherman and Troy D. Drewry
  4. **Des. 403,069 – Orthopedic Bone Support**  
Inventors: Troy Drewry and Michael C. Sherman
  5. **5,879,350 – Multi-Axial Bone Screw Assembly**  
Inventors: Michael C. Sherman and Troy D. Drewry
  6. **5,885,286 – Multi-Axial Bone Screw Assembly**  
Inventors: Michael C. Sherman and Troy D. Drewry
  7. **5,891,145 – Multi-Axial Screw**  
Inventors: Matthew Morrison, Michael C. Sherman, and Troy D. Drewry
  8. **5,897,556 – Device for Supporting Weak Bony Structures**  
Inventors: Michael C. Sherman and Troy D. Drewry
  9. **5,947,966 – Device for Linking Adjacent Rods in Spinal Instrumentation**  
Inventors: Troy Drewry, Michael C. Sherman, James E. Van Hoeck, Denis S. Drummond, David L. Brumfield, and M. Neil Anderson
  10. **5,951,553 – Methods and Apparatus for Fusionless Scoliosis Treatment of Spinal Deformities**  
Inventors: Randall Betz, Michael C. Sherman, and Troy D. Drewry
  11. **5,954,725 – Multi-Angle Bone Screw Assembly Using Shape-Memory Technology**  
Inventors: Michael C. Sherman and Troy D. Drewry
  12. **5,976,135 – Lateral Connector Assembly**  
Inventors: Michael C. Sherman, Eddie Ray III, Troy D. Drewry, and David Shapiro
  13. **6,053,917 – Multi-Axial Bone Screw Assembly**  
Inventors: Michael C. Sherman and Troy D. Drewry
  14. **6,132,434 – Multi-Angle Bone Screw Assembly Using Shape-Memory Technology**

Inventors: Michael C. Sherman and Troy D. Drewry

15. **6,149,651 – Device for Supporting Weak Bony Structures**  
Inventors: Troy D. Drewry and Michael C. Sherman
16. **6,235,028 – Surgical Guide Rod**  
Inventors: David L. Brumfield, Paige A. Myrick, B. Thomas Barker, and Troy D. Drewry
17. **6,287,308 – Methods and Apparatus for Fusionless Treatment of Spinal Deformities**  
Inventors: Randall Betz, Michael C. Sherman, Troy Drewry
18. **6,287,311 – Multi-angle Bone Screw Assembly Using Shape-Memory Alloy Technology**  
Inventors: Michael C. Sherman, Troy Drewry
19. **6,296,643 – Device for the Correction of Spinal Deformities Through Vertebral Body Tethering Without Fusion**  
Inventors: Christoph Hopf, Troy Drewry, Michael C. Sherman
20. **6,299,613 – Device for the Correction of Spinal Deformities Through Vertebral Body Tethering Without Fusion**  
Inventors: James Ogilvie, Christoph Hopf, Michael C. Sherman, Troy Drewry, Jean Saurat
21. **6,325,805 – Shape Memory Alloy Staple**  
Inventors: James Ogilvie, Troy D. Drewry, Michael C. Sherman
22. **6,436,099 – Adjustable Spinal Tether**  
Inventors: Troy D. Drewry, Michael C. Sherman, David Brumfield
23. **6,454,773 – Multi-angle Bone Screw Assembly Using Shape-Memory Alloy Technology**  
Inventors: Michael C. Sherman, Troy Drewry
24. **6,605,090 – Non-metallic Implant Devices and Intra-Operative Methods for Assembly and Fixation**  
Inventors: Michael C. Sherman, Troy Drewry
25. **6,616,669 – Method for the Correction of Spinal Deformities Through Vertebral Body Tethering Without Fusion**  
Inventors: James Ogilvie, Michael C. Sherman, Troy Drewry, Jean Saurat
26. **6,623,484 – Method and Apparatus for Fusionless Treatment of Spinal Deformities**  
Inventors: Randall Betz, Michael C. Sherman, Troy Drewry
27. **6,773,437 – Shape Memory Alloy Staple**  
Inventors: James Ogilvie, Michael C. Sherman, Troy Drewry, Jean Saurat
28. **6,783,527 – Flexible Spinal Stabilization System and Method**  
Inventors: Troy D. Drewry and Fred J. Molz
29. **6,991,653 – Vertebral Body and Disc Space replacement device**  
Inventors: White, John L., DeRidder, Steven D., Berry, Bret M., Frey, George, Moore, Jeffrey D., Scifert, Jeffrey L., Drewry, Troy D., Smithey, Jeffrey S., and Lange, Eric C.
30. **7,018,379 – Flexible Spinal Stabilization System and Method**  
Inventors: Troy D. Drewry and Fred J. Molz
31. **7,094,240 – Flexible Member Tensioning Instrument and Methods**  
Inventors: Fred J. Molz, Michael C. Sherman, and Troy D. Drewry

32. **7,172,593 – Non-metallic Implant Devices and Intra-operative Methods for Assembly**  
Inventors: Hai H. Trieu, Jeff R. Justis, Troy D. Drewry, Michael C. Sherman, Bradley J. Coates, and Bradley T. Estes
33. **7,285,121 – Devices and Methods for the Correction and Treatment of Spinal Deformities**  
Inventors: John T. Braun, Fred J. Molz, Troy D. Drewry, and Michael C. Sherman
34. **7,367,978 – Adjustable Spine Tether**  
Inventors: Troy D. Drewry, Michael C. Sherman, and David L. Brumfield
35. **7,517,359 – Vertebral Rod Assemblies and Methods**  
Inventors: Troy D. Drewry and Barry Null
36. **7,556,630 – Flexible Member Tensioning Instrument and Methods**  
Inventors: Fred J. Molz, Michael C. Sherman, and Troy D. Drewry
37. **7,615,078 – Vertebral Body and Disc Space Replacement Device**  
Inventors: John L. White, Steven D. DeRidder, Bret M. Berry, George Frey, Jeffrey D. Moore, Jeffrey L. Scifert, Troy D. Drewry, Jeffrey S. Smithey, and Eric C. Lange
38. **7,625,380 – Dual Distractor Inserter**  
Inventors: Troy D. Drewry and Bret M. Berry
39. **7,722,648 – Crosslink Interconnection of Bone Attachment Devices**  
Inventors: Troy D. Drewry, William Barry Null, and Marc T. Paul
40. **7,828,826 – Flexible Spine Stabilization System and Method**  
Inventors: Troy D. Drewry and Fred J. Molz
41. **7,837,714 – Methods and Devices Interconnection of Bone Attachment Devices**  
Inventors: Troy D. Drewry, William Barry Null, and Marc T. Paul
42. **7,867,258 – Multi-Axial Bone Attachment Member**  
Inventors: Troy D. Drewry, William Barry Null, and Marc T. Paul
43. **7,901,434 – Vertebral Rod Assemblies and Methods**  
Inventors: Troy D. Drewry and William Barry Null, and Marc T. Paul
44. **7,909,855 – Orthopedic Implant Assembly**  
Inventors: Troy D. Drewry, William Barry Null, and Marc T. Paul
45. **7,951,177 – Non-metallic Implant Devices and Intra-operative Methods for Assembly and Fixation**  
Inventors: Hai H. Trieu, Jeff R. Justis, Troy D. Drewry, Michael C. Sherman, Bradley J. Coates, and Bradley T. Estes
46. **7,988,711 – Low Profile Vertebral Stabilization Systems and Methods**  
Inventors: David R. Erickson, Troy D. Drewry, Robert A. Farris, and Jason Michael May
47. **8,142,483 – Flexible Spine Stabilization System and Method**  
Inventors: Troy D. Drewry and Fred J. Molz
48. **8,353,934 – Crosslink Interconnection of Bone Attachment Devices**  
Inventors: Troy D. Drewry, William Barry Null, and Marc T. Paul
49. **8,512,406 – Vertebral Body and Disc Space Replacement Devices**

Inventors: John L. White, Steven D. DeRidder, Bret M. Berry, George Frey, Jeffrey D. Moore, Jeffrey L. Scifert, Troy D. Drewry, Jeffrey S. Smithey, Eric C. Lange

50. **8,672,972 – Low Profile Vertebral Stabilization Systems and Methods**

Inventors: David R. Erickson, Troy D. Drewry, Robert A. Farris, and Jason Michael May

51. **8,911,480 – Non-metallic Implant Devices and Intra-operative Methods for Assembly and Fixation.**

Inventors: Hai H. Trieu, Jeff R. Justis, Troy D. Drewry, Michael C. Sherman, Bradley J. Coates, and Bradley T. Estes

52. **9,101,489 – Expandable Anterior Lumbar Interbody Fusion Device.**

Inventors: Dimitri Protopsaltis, Troy D. Drewry, Joshua Morin, and Hugues Malandain

53. **9,358,045 – Flexible Spine Stabilization System and Method**

Inventors: Troy D. Drewry and Fred J. Molz

54. **9,370,382 – Translaminar Interspinous Stabilization System**

Inventors: John S. Thalgott, David T. Stinson, and Troy D. Drewry

55. **9,387,089 – Expandable Anterior Lumbar Interbody Fusion Device**

Inventors: Dimitri Protopsaltis, Troy D. Drewry, Joshua Morin, and Hugues Malandain

## **PUBLICATIONS / PRESENTATIONS**

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1. Lewis G, Drewry TD, Sherman MC: **A Thoracic Spine Testbed for the Comparative Biomechanical Evaluation of Spinal Instrumentations.** *Journal of Spinal Disorders*, June 1995, 186-94.
2. Drewry TD, Sherman MC, Lewis G: **Biomechanical Comparison Between Single and Dual Rod Texas Scottish Rite Hospital (TSRH™) Posterior Scoliosis Constructs: An Experimental Stress Analysis.** Presented at The 30<sup>th</sup> Annual Meeting of the Scoliosis Research Society. Asheville, NC, September 13-16, 1995.
3. Huntington CF, Betz RR, Maxy P, Clements III DH, Drewry TD, Sherman MC, Pafford JA: **Biomechanical Finite Element Analysis of Spinopelvic Fixation in Long Segment Spinal Fixation Constructs.** Presented at The 66<sup>th</sup> Annual Meeting of the American Academy of Orthopaedic Surgeons. Anaheim, CA, February 4-8, 1999.
4. Drewry, TD, Braun, JT, Ogilvie, JW: **Fusionless Scoliosis Correction Using a Shape Memory Alloy Staple in the Anterior Thoracic Spine of the Immature Goat.** Presented at the 19<sup>th</sup> Annual Science and Technology Conference at Medtronic Corporate Headquarters in Minneapolis, MN, September 20-22, 2000.
5. Drewry, TD, Scifert, S: **Resorbable Spinal Implants in a Sheep Model: Radiographic, Histologic, and Biomechanical Preliminary Results.** Presented at the BioTechnologies for Spinal Surgery Meeting. Halle, Germany, April 11-13, 2002.
6. Betz RR, Cunningham B, Selgrath C, Drewry TD, Sherman MC: **Preclinical Testing of a Wedge-Rod System for Fusionless Correction of Scoliosis.** *SPINE*, Vol. 28 No. 20, 15 OCT 2003, pp S275-278.
7. Drewry, TD: Represented AIC at **MB Venture's 5<sup>th</sup> Annual Musculoskeletal New Ventures Conference.** Memphis, TN, October 9-10, 2007.
8. Drewry, TD: Represented AIC at **Canaccord Adams Musculoskeletal Conference.** Las Vegas, NV, February 24, 2009.
9. Drewry, TD: Represented MB Innovations at **Musculoskeletal New Ventures Conference.** Memphis, TN, October 29, 2015.

## **PROFESSIONAL AFFILIATIONS (PAST AND PRESENT)**

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- ◆ Member, Engineering Advisory Board, University of Mississippi
- ◆ Member, Engineering Biotech Advisory Board, Christian Brothers University
- ◆ Member, Industrial Advisory Board for University of Memphis's Department of Mechanical Engineering
- ◆ Former Member, Industrial Advisory Board for University of Southwestern Louisiana's Department of Mechanical Engineering
- ◆ Orthopedic Research Society
- ◆ Society of Biomaterials
- ◆ American Society of Mechanical Engineers
- ◆ American Society of Testing and Materials
- ◆ Society of Biomedical Engineers
- ◆ Engineer in Training

## **INTERESTS AND ACTIVITIES**

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- ◆ Parishioner, St. Louis Catholic Church
- ◆ Fly Fishing & Fly Tying
- ◆ Duck, Turkey, & Deer Hunting
- ◆ Cycling (Road and Mountain Bike)
- ◆ Swimming
- ◆ Reading
- ◆ Cooking

8/31/17