

BIOGRAPHICAL SKETCH

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NAME: Prawel, David A.

eRA COMMONS USER NAME (credential, e.g., agency login): D_Prawel

POSITION TITLE: Associate Research Professor, Associate Director Biomaterials Research & Engineering Laboratory, Dept. of Mechanical Engineering, Colorado State University

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE <i>(if applicable)</i>	Completion Date MM/YYYY	FIELD OF STUDY
State University of New York at Buffalo Buffalo, NY	B.S.	1978	Biology
State University of New York at Buffalo Buffalo, NY	M.S.	1980	Natural Sciences – Interdisciplinary
Colorado State University Ft. Collins, CO	Ph. D.	2011	Biomedical Engineering

A. Personal Statement

I took a non-traditional path to my current career as a soft-money funded research professor. I enjoyed nearly three decades in the 3D software industry, during which I helped build several successful start-up companies, one of which we took public in 1999. In Fall 2007 I read an article about the huge number of kids that lose a limb to bone cancer, and this revelation sent me on a new life path. I returned to academics to complete a PhD degree I had always coveted, and to rejoin the research path I had started in the late-70s in order to work on this problem. My passion since my first publication in *Science* in 1981 was always in leveraging 3D technology in orthopedic healthcare. My PhD research and other early work focused on early-stage bone development and bio-interaction related to surface enhancement and drug delivery on some novel orthopedic biomaterials. I received a rich education in tissue engineering and bone biology to complement my 3D background. After completing my PhD I stayed at CSU, rising from post-doc to Associate Research Professor and Associate Director of the Biomaterials Research and Engineering Laboratory. Along the way, I also founded and direct CSU's 3D printing lab, building on my rich entrepreneurial experience in this field. My main research interest is bone regeneration and limb-sparing, particularly to develop complex, patient-specific scaffolds and surgical devices to accelerate bone healing in critical defects. I am fortunate to have a world-class team of researchers to work with. My current collaborations include investigation of a novel approach to osteoporosis treatment, critical defect treatment, limb-sparing and testing new biomimetic biomaterials. These are a few of my many opportunities to work with distinguished scientists in multidisciplinary research teams. I have found a distinct advantage in coming from decades of industrial experience making 3D technology solve problems. The team I have assembled for this project brings together rich experience in all the critical aspects of this field: bone regeneration, tissue engineering, biointerfaces, biomechanics, biofluids, and veterinary and

human orthopedic health care, areas where large defects are all too common and especially challenging.

Ongoing and recently completed projects that I would like to highlight include:

ONGOING: Validating a new, commercially viable biomaterial for bone healing

PI: Prawel 3/1/2022 – 2/28/2024

National Institutes of Health, NIAMS, NIH 1R21AR080938 - 01

ONGOING: Validating a new, commercially viable biomaterial for bone healing

PI: Prawel 1/14/2022 – 2/28/2024

CTGG1 2022-2892: State of Colorado, Office of Economic Development & International Trade

A Novel Approach to Healing Critical Bone Defects

PI: Prawel 2/7/2021 – 6/30/2022 (continued to 6/30/2023)

Colorado State University, Translational Medicine Institute Translational Acceleration Program

Testing A Novel Approach to Healing Critical Bone Defects

PI: Prawel 5/1/2021 – 4/30/2022

NIH/NCATS Colorado CTSI UL1 TR002535; TM-C-21-23: Colorado Clinical and Translational Sciences Institute (CCTSI) 2021 Pilot Grant

Tissue Engineering Strategies for Promoting Rapid Fracture Healing in Osteoporotic Bone

PI: Nicole Ehrhart (Prawel co-I) June 2018 to May 2020

Colorado State University, Office of the Vice President for Research Seed Fund

Pilot Funding for Innovative Research in Aging

3D printing of patient-specific biodegradable endoprostheses for large segmental bone defects

Co-PI: Prawel July 2017 to June 2019

CSU Office of the Vice President for Research Strategic Investment Fund

Highlighted (recent) Citations:

Baumer, V., Gunn, E., Riegler, V., Bailey, C., Shonkwiler, C., Prawel, D. Robocasting of Ceramic Fischer–Koch S Scaffolds for Bone Tissue Engineering. *J. Funct. Biomater.* 2023, 14, 251.

Nelson Isaacson, Katherine V. Lopez-Ambrosio, Laura Chubb, Nathan Waanders, Emily Hoffmann, Connor Witt, Susan P. James, David A. Prawel, Compressive Properties and Failure Behavior of Photocast Hydroxyapatite Gyroid Scaffolds Vary with Porosity, *Journal of Biomaterials Applications*, 2022, March, 1-22.

B. Positions and Honors

Positions and Employment

2007 to present: Associate Director, Biomaterials Research and Engineering Laboratory, Colorado State University

2013 to present: Founder & Director, Idea-2-Product Laboratory for Advanced and Additive Manufacturing, Colorado State University

2001 to present: Founder, President, Principal Consultant, Longview Advisors Inc. Consulting in 3D digital product development, Expert opinion in engineering software patent reviews and intellectual property assessment; Founder & past Chair (2006 to 2018): 3D Collaboration & Interoperability Congress, now in it's 16th year

2003 to 2006: Co-founder, Rise Broadband (a.k.a. SkyBeam Wireless, LP Broadband Inc.), a wireless internet service provider (WISP); Sold company in 2007, Now among the largest WISPs in the US, exceeding 340,000 customers in nine western states

2000 to 2001: President & CEO, Critical Reach Inc.; 3D web-based manufacturing and MRO (maintenance, repair and operations) software company; Re-launched this German company in the US market and sold company in 2001

1993 to 2000: Vice President, Spatial Technology Inc.; A 3D Engineering Software start-up company; VP of Strategy and Business Development (commercial licensing/technology transfer, mergers & acquisitions, product revenue through third party collaborations); Managed international teams of software engineering and other professionals; Helped lead company through its successful IPO and subsequent sale

1988 to 1992: Director, Product Strategy & Marketing, Precision Visuals Inc.; A 3D scientific software start-up company

1985 to 1988: Director, Product Marketing and Customer Education, Unicad Inc.; A 3D engineering software start-up company; sold company to a French company

1982 to 1984: Software Engineer, Autotrol Technology Corp.; A 3D engineering software start-up company; Software Engineer and Managed partnerships with 3rd party software suppliers

1980 to 1982: Ph.D. Candidate (GRA), Rutgers University, New Brunswick, NJ; Department of Physiology; completed qualifying exams, then left to join the computer business

1978 to 1980: M.S. Candidate (GRA, GTA), State University of New York at Buffalo Buffalo, NY; Department of Physiology; completed M.S.

1977 to 1978: Research Technician, Ecology Consultants Inc., Buffalo, NY; various analytical duties, statistical (computer-based) data analysis

1976 to 1978: Research Intern, State University of New York at Buffalo Buffalo, NY; Department of Physiology; various analytical and laboratory duties

Relevant Accomplishments – start-up ventures (see details above):

Founder, Longview Advisors Inc., Loveland, Colorado (2001 to present)

Co-founder, Skybeam, Inc. (2003 to 2006)

Spatial Technology Inc., Boulder, Colorado (1993 to 2001) – successful IPO and sale

Precision Visuals Inc., Boulder, Colorado (1988 to 1992)

Unicad Inc., Boulder, Colorado (1985 to 1988)

Autotrol Technology, Denver, Colorado (1982 to 1984)

Honors & Awards: 2015 OPIE Award for Excellence in Online Education, CSU

2019: Outstanding Researcher in the College of Engineering

2019: two patent awards

2020: one patent award

C. Contributions to Science

1. *Large bone defects & limb sparing.* Poor healing of large bone defects remains one of the biggest challenges in human orthopedic medicine, affecting more than 1.5 million Americans per year and often leading to infections and other clinical complications, reoperations, poor functional outcomes, and ultimately, all too often, limb loss. In 2015, this resulted in significant personal and economic cost of more than \$1 billion per year. Based on this unmet clinical need, there is significant interest in the application of biomedical and tissue engineering strategies to stimulate and accelerate natural bone repair. Our current orthopedics research is focused on developing personalized scaffolds in complex shapes engineered to enhance bioactivity, along with related devices that can help accelerate healing of critical-sized bone defects and save limbs.

- a. Baumer V, Isaacson N, Kanakamedala S, McGee D, Kaze I, **Prawel** D. Comparing ceramic Fischer-Koch-S and gyroid TPMS scaffolds for potential in bone tissue engineering. *Front Bioeng Biotechnol* 2024;12:1410837. <https://doi.org/10.3389/fbioe.2024.1410837>.
- b. Baumer, V., Gunn, E., Riegle, V., Bailey, C., Shonkwiler, C., **Prawel**, D. Robocasting of Ceramic Fischer-Koch S Scaffolds for Bone Tissue Engineering. *J. Funct. Biomater.* 2023, 14, 251.
- c. Nelson Isaacson, Katherine V. Lopez-Ambrosio, Laura Chubb, Nathan Waanders, Emily Hoffmann, Connor Witt, Susan P. James, David A. **Prawel**, Compressive Properties and Failure Behavior of Photocast Hydroxyapatite Gyroid Scaffolds Vary with Porosity, *Journal of Biomaterials Applications*, 2022, March, 1-22.
- d. Lopez Ambrosio, Katherine V. *HYDROXYAPATITE STRUCTURES CREATED BY ADDITIVE MANUFACTURING WITH EXTRUDED PHOTOPOLYMER*. Master's Thesis, Ft. Collins, CO: Colorado State University; 2019; 2019.

2. Prior to my interest in critical defect bone healing, I researched biomaterials for blood contacting applications like heart valves and developed a novel drug-eluting phospholipid coating to deliver antibiotics from titanium implants, for potential use in orthopedic applications. This work provided a rich education in bone biology and orthopedics, launching me on my current research path.

- a. David A. **Prawel**, Harold Dean, Marcio Forleo, Nicole Lewis, Justin Gangwish, Ketul C. Popat, Lakshmi Prasad Dasi, Susan P. James, "Hemocompatibility and Hemodynamics of Novel Hyaluronan - Polyethylene Materials for Flexible Heart Valve Leaflets", *Cardiovascular Engineering and Technology*, March 2014, Volume 5, [Issue 1](#), pp 70-81.
- b. David A. **Prawel**, Matt J. Kipper, Ketul C. Popat and, Susan P. James, "Electrohydrodynamic Atomization Technique for Applying Phospholipid Coatings to Titanium Implant Material", *Materials Letters* 97 (2013) 81–85.
- c. Triffo, T., Susan James, Nicole Ehrhart, Debra Kamstock, Laura Chubb, David **Prawel**, *In Vivo* Efficacy of Antibiotic-Eluting Phospholipid Coated Implants, *World Biomaterials Congress*, Chengdu, China, June 2012.
- d. Carroll, D.A., Michael V. Onorato, Jennifer Lee, Kaitlin Spink, Ketul C. Popat, and David **Prawel**, *Low-Cost 3D Bio-Printing of Cellularized Vascular Graft Prototypes*, 9th Annual Meeting of the Rapid Product Development Association of South Africa, Vanderbiltpark, South Africa, November 2011.

3. Finally, I started my research career many years ago looking at very basic, fundamental questions about animals and locomotion that involved some of the very early work in 3D modeling. Little did I know when I got started that we would end up making some fundamental contributions to our overall basic understanding of animal locomotor energetics and 3D kinematic modeling. Most importantly, it provided for me, early in my life, a foretelling that I had serious passion for, and would be happiest as a scientist, a path I feel so blessed to have returned to.

- a. Herreid, C.F., D.A. **Prawel** and R.J. Full, Energetics of Running Cockroaches, *Science*, 212 (1981) 331-333.