- Christopher P. Cheng, Ph.D. -

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Summary

- Executive management, R&D, sales training, business development, preclinical and clinical testing
- Expertise in biomechanics, medical imaging, FEA, geometric modeling, statistics, epidemiology, anatomy/physiology
- Implant design, mechanical design, Nitinol, manufacturing & processing techniques
- Experience with FDA regarding device fatigue, simulation, animal testing, and MRI safety/compatibility
- Advising of doctoral and postdoctoral students; teaching
- Author of 22 journal publications, and 38 conference publications

Education

Stanford University	Stanford, CA	**Ph.D.**, 2002 Mechanical Engineering (Biomechanical Engineering Division)
Stanford University	Stanford, CA	**M.S.**, 2000 Mechanical Engineering (Biomechanical Engineering Division)
Duke University	Durham, NC	**B.S.E.**, 1998 Biomedical Engineering and Electrical & Computer Engineering
University of Oxford	Oxford, England	Study in Economics and International Markets, 1996

Professional History

2012 – Present • **Kōli, Inc.**
CEO

- Minimally-invasive treatment for gallstone disease

2006 – Present • **Stanford University, Department of Surgery**
Consulting Associate Professor (2012 – Present)
Consulting Assistant Professor (2006 – 2011)

- Director of biomechanics research related to interactions between the cardiovascular system and implantable vascular devices using medical imaging, geometric modeling, and computational methods
- Principal Investigator for vascular biomechanics research funded by NIH and medical device companies
- Post-doctoral advisee: Ga-Young Suh, Ph.D. (2011 -)
- Doctoral advisees: Adam Tenforde, M.D. (2006-2010), Gilwoo Choi, Ph.D. (2005-2009)

2002 – Present • **Biomedical Consulting**
Consultant

- Consulting for medical imaging, anatomy/physiology, biomechanics, engineering testing, device design, regulatory

1999 – Present • **Enology**
Lecturer, Consultant, Buyer, and Judge

- Certified Specialist of Wine (CSW) through the Society of Wine Educators
- Private labeling of ultra-premium wines for individual and corporate clients
- Wine consultant for Chez TJ (Michelin star restaurant) in Mountain View, CA
- Founder and lecturer of Stanford Viticulture Course and Stanford Wine Club; Member of Stanford Wine Program
- Wine lecturing, consulting, and judging for trade, corporate, and private events

2011 – 2012 • **Nitinol Devices & Components**
Entrepreneur in Residence

- Emerging opportunities

2011 • **Tendyne Medical, Inc.**
General Manager

- Minimally-invasive treatment for mitral regurgitation

2007 – 2010 • **NovoStent Corporation**
Director of Technology

- Directed technology development for a peripheral stent platform, including functional requirements, stent design, materials, clinical performance, and *in vivo*, *in vitro*, and *in silico* testing

- In charge of end-to-end R&D of next generation stent from design through pivotal GLP animal trial and other preclinical evaluations leading up to European clinical trial and US-IDE

2005 – 2007 • **Johnson & Johnson, Nitinol Devices & Components and Cordis Corporation**
Principal Engineer/Program Manager

- Founder and director of the Cordis Biomechanics Group; led international team to investigate the biomechanical environment of the cardiovascular system for clinical trials, academic research, device design, and testing
- Cardiovascular Device Design; exploratory research and development for a novel hybrid vascular implant and other early device concepts; FDA interactions for IDE submissions, e.g. fatigue and MRI testing

2002 – 2005 • **Stanford University, Departments of Mechanical Engineering, Pediatrics, and Radiology**
Research Associate

- Hemodynamic quantification in large vessels at rest and during exercise for healthy subjects, patients with systemic vascular disease, and pediatric patients with congenital heart disease
- RESIStent Program: Consortium with medical device industry to describe the superficial femoral artery environment

1998 – 2002 • **Stanford Cardiovascular Biomechanics Lab**
Ph.D. Student

- Quantification of hemodynamic conditions in the human abdominal aorta at rest and during exercise involving: computational methods, mechanical design, MRI scanning, medical imaging physics, clinical trials, cardiovascular anatomy and physiology, exercise physiology, epidemiology, statistics

1995 – 1998 • **Internships and Academic Research**

- Neural network software development for Global Science & Technology, Inc.
- Mechanism design for 2nd and 3rd Servicing Missions of the Hubble Space Telescope for Swales Aerospace/NASA
- Orthopedic biomechanics research for Duke Orthopedics Biomechanics Lab

Patents, Applications, and Disclosures

- Stent, Patent #US D665,500 S (2012)
- Delivery System for Vascular Prosthesis with Decreased Deployment Force (2010)
- Vascular Prosthesis with Stress Relief Slots (2009)
- Vascular Prosthesis Assembly with Retention Mechanism and Method (2008)
- Radially Expandable Prosthesis with Electrospun Covering and Method for Producing Same (2006)
- Extra Flexible Stent Ends Designed for Overlapping to Produce Approximate Uniform Flexibility Along The Entire Stented Length (2006)
- Fiber Bridges Between Stent Rings to Communicate Tension While Freely Accommodating Compression, Bending, and Torsion (2006)
- Methods and Apparatus for Matching the Axial Strain State of Intraluminal Implantable Devices with that of Surrounding Native Tissue (2006)
- Methods and Apparatus to Increase Axial Tension in a Blood Vessel Using an Intraluminal Implant (2006)
- Methods and Apparatus to Shorten a Blood Vessel and/or Increase Axial Tension (2006)

Board Memberships

- Corporate Boards: Kōli, Tendyne Medical, The Power Rank
- Scientific Advisory Boards: 480 Biomedical

Awards

- Standards of Leadership Award, Johnson & Johnson (2006)
- Whitaker Fellow, The Whitaker Foundation (1998-2002)
- First Place of Ph.D. competition at ASME Summer Bioengineering Conference (2001)

Other Accomplishments & Skills

- *Boy Scouts of America* – Eagle Scout with Gold Palm; Order of the Arrow
- *Martial Arts* – Black Belt in Tang Soo Do; Kung-fu training at The Shaolin Temple of China; Boxing at Oxford
- *Foreign Language* – Fluent in Mandarin Chinese

Journal Publications

In Preparation

- Suh, G., Choi, G., Herfkens, R.J., Dalman, R.L., **Cheng, C.P.** "Respiration-Induced Deformation of the Superior Mesenteric and Renal Arteries in Patients with Abdominal Aortic Aneuryms"
- Choi, G., Xiong, G., **Cheng, C.P.**, Taylor, C.A. "Three-Dimensional Surface-Based Methods for Quantifying Arterial Deformation"

Published

1) Suh, G., Choi, G., Draney, M.T., Herfkens, R.J., Dalman, R.L., **Cheng, C.P.** "Respiratory-Induced 3D Deformations of the Renal Arteries Quantified with Geometric Modeling During Inspiration and Expiration Breath-holds of Magnetic Resonance Angiography," *Journal of Magnetic Resonance Imaging*, in press.
2) Suh, G., Les, A.S., Tenforde, A.S., Shadden, S.C., Spilker, R.L., Yeung, J.J., **Cheng, C.P.**, Herfkens, R.J., Dalman, R.L., Taylor, C.A. (2011) "Hemodynamic Changes Quantified in Abdominal Aortic Aneurysms With Increasing Exercise Intensity Using MR Exercise Imaging and Image-Based Computational Fluid Dynamics," *Annals of Biomedical Engineering*, 39(8): 2186-2202.
3) Zeller, T., Braunlich, S., Waldo, M., **Cheng, C.P.**, Macharzina, R., Scheinert, D., Rastan, A. (2011) "The NovoStent® SAMBA® stent: A novel alternating helix self-expanding nitinol stent design," *Interventional Cardiology*, 3(2): 247-261.
4) Suh, G., Les, A.S., Tenforde, A.S., Shadden, S.C., Spilker, R.L., Yeung, J.J., **Cheng, C.P.**, Herfkens, R.J., Dalman, R.L., Taylor, C.A. (2011) "Quantification of Particle Residence Time in Abdominal Aortic Aneurysms Using Magnetic Resonance Imaging and Computational Fluid Dynamics," *Annals of Biomedical Engineering*, 39(2): 864-883.
5) Tenforde, A.S., **Cheng, C.P.**, Suh, G., Herfkens, R.J., Dalman, R.L., Taylor, C.A. (2010) "Quantifying *In Vivo* Hemodynamic Response to Exercise in Patients with Intermittent Claudication and Abdominal Aortic Anuerysms Using Cine Phase-Contrast MRI," *Journal of Magnetic Resonance Imaging*, 31(2): 425-429.
6) **Cheng, C.P.**, Choi, G., Herfkens, R.J., Taylor, C.A. (2010) "The Effect of Aging on Deformations of the Superficial Femoral Artery Due to Hip and Knee Flexion: Potential Clinical Implications," *Journal of Vascular and Interventional Radiology*, 21(2): 195-202.
7) Choi, G., Suh, G., Shin, L.K., Taylor, C.A., **Cheng, C.P.** (2009) "*In Vivo* Deformation of the Human Abdominal Aorta and Common Iliac Arteries With Hip and Knee Flexion: Implications for the Design of Stent-Grafts," *Journal of Endovascular Therapy*, 16(5): 531-538.
8) Choi, G., **Cheng, C.P.**, Wilson, N.M., Taylor, C.A. (2009) "Methods for Quantifying Three-Dimensional Deformation of Arteries Due to Pulsatile and Nonpulsatile Forces: Implications for the Design of Stents and Stent Grafts," *Annals of Biomedical Engineering*, 37(1): 14-33.
9) **Cheng, C.P.** (2008) "A Review of Peripheral Vascular Deformations Due to Respiration and Musculoskeletal Influences," *Journal of ASTM International (Symposium on Fatigue and Fracture of Medical Metallic Materials and Devices)*, 5(10): Paper ID JAI102074.
10) Robertson, S.W., **Cheng, C.P.**, Razavi, M.K. (2008) "Biomechanical Response of Stented Carotid Arteries to Swallowing and Neck Motion," *Journal of Endovascular Therapy*, 15: 663-671.
11) Robertson, S.W., Jessup, D.B., Boero, I.J., **Cheng, C.P.** (2008) "Right Renal Artery *In Vivo* Stent Fracture," *Journal of Vascular and Interventional Radiology*, 19: 439-442.
12) **Cheng, C.P.**, Taur, A.S., Lee, G.S., Goris, M.L., Feinstein, J.A. (2006) "Relative Lung Perfusion Distribution in Normal Subjects: Observations and Clinical Implications," *Congenital Heart Disease*, 1: 210-216.
13) **Cheng, C.P.**, Wilson, N.M., Hallett, R.L., Herfkens, R.J., Taylor, C.A. (2006) "*In Vivo* MR Angiographic Quantification of Axial and Twisting Deformations of the Superficial Femoral Artery Resulting from Maximum Hip and Knee Flexion," *Journal of Vascular and Interventional Radiology*, 17: 979-987.
14) Tang, B.T., **Cheng, C.P.**, Draney, M.T., Wilson, N.M., Tsao, P.S., Herfkens, R.J., Taylor, C.A. (2006) "Abdominal Aortic Hemodynamics in Young Healthy Adults at Rest and during Lower Limb Exercise: Quantification using Image-Based Computer Modeling," *American Journal of Physiology – Heart and Circulatory Physiology*, 291: H668-H676.
15) **Cheng, C.P.**, Herfkens, R.J., Taylor, C.A., Feinstein, J.A. (2005) "Proximal Pulmonary Artery Blood Flow Characteristics in Healthy Subjects Measured in an Upright Posture Using MRI: The Effects of Exercise and Age," *Journal of Magnetic Resonance Imaging*, 21: 752-758.
16) **Cheng, C.P.**, Herfkens, R.J., Lightner, A.L., Taylor, C.A., Feinstein, J.A. (2004) "Blood Flow Conditions in the Proximal Pulmonary Arteries and Vena Cavae in Healthy Children During Upright Seated Rest and Cycling Exercise, Quantified with MRI," *American Journal of Physiology – Heart and Circulatory Physiology*, 287(2): H921-926.
17) **Cheng, C.P.**, Herfkens, R.J., Taylor, C.A. (2003) "Abdominal Aortic Hemodynamic Conditions in Healthy Subjects Aged 50-70 at Rest and During Lower Limb Exercise: *In Vivo* Quantification Using MRI," *Atherosclerosis*, 168: 323-331.

18) **Cheng, C.P.**, Herfkens, R.J., Taylor, C.A. (2003) "Inferior Vena Caval Hemodynamics Quantified *In Vivo* at Rest and During Lower Limb Exercise Using Magnetic Resonance Imaging," *American Journal of Physiology – Heart and Circulatory Physiology*, 284(4): H1161-1167.
19) **Cheng, C.P.**, Herfkens, R.J., Taylor, C.A. (2003) "Dynamic Exercise Imaging With an MR-Compatible Stationary Cycle Within the General Electric Open Magnet," *Magnetic Resonance in Medicine*, 49(3): 581-585.
20) **Cheng, C.P.**, Herfkens, R.J., Taylor, C.A. (2003) "Comparison of Abdominal Aortic Hemodynamics Between Men and Women at Rest and During Lower Limb Exercise," *Journal of Vascular Surgery*, 37(1): 118-123.
21) **Cheng, C.P.**, Parker, D., Taylor, C.A. (2002) "Quantification of Wall Shear Stress in Large Blood Vessels Using Lagrangian Interpolation Functions with Cine PC-MRI," *Annals of Biomedical Engineering*, 30: 1020-1032.
22) Taylor, C.A., **Cheng, C.P.**, Espinosa, L.A., Tang, B.T., Parker, D., Herfkens, R.J. (2002) "*In Vivo* Quantification of Blood Flow and Wall Shear Stress in the Human Abdominal Aorta During Lower Limb Exercise," *Annals of Biomedical Engineering*, 30: 402-408.

Conference Publications

1) Suh, G., Beygui, R., Marangi, R., Fleischmann, D., **Cheng, C.P.** (2013) "Respiratory- and Cardiac-Induced Branch Deformation of the Aortic Arch Vessels in Patients with Thoracic Aortic Disease," *2013 International Symposium of Endovascular Therapy*, Poster ID #20.
2) Suh, G., **Cheng, C.P.** (2012) "Respiration-induced Deformation of the Abdominal Arteries in Patients with Abdominal Aortic Aneurysms," *2012 US-Korea Conference*.
3) Suh, G., Choi, G., Draney, M.T., Herfkens, R.J., Dalman, R.L., **Cheng, C.P.** (2012) "Respiratory Deformation of the Superior Mesenteric Artery and Renal Arteries in Patients with Abdominal Aortic Aneurysms," *2012 Society of Interventional Radiology Annual Scientific Meeting*, Abstract #422.
4) Suh, G., Choi, G., Draney, M.T., Herfkens, R.J., Dalman, R.L., **Cheng, C.P.** (2012) "Respiratory Deformation of the Renal Arteries in Healthy Subjects and Patients with Abdominal Aortic Aneurysms," *2012 International Symposium of Endovascular Therapy*, Abstract #750042.
5) **Cheng, C.P.**, Suh, G., Choi, G. (2010) "Renal Artery and Abdominal Aortic Biomechanics," *2010 Stent Summit at the Cleveland Clinic*, Invited Faculty.
6) Zeller, T., Johnson, A., **Cheng, C.P.**, Martin, G.R. (2009) "Evaluation of NovoStent's SAMBA Stent," *2009 Transcatheter Therapeutics Conference*, Abstract #597.
7) Zeller, T., Johnson, A., **Cheng, C.P.**, Martin, G.R. (2009) "Animal Evaluation of a Novel Alternating Helical Stent," *EuroPCR, EuroIntervention*, Volume 5, Supplement E, p. E41.
8) Choi, G., Dusch, M.N., Xiong, G., Xiao, N., **Cheng, C.P.**, Taylor, C.A. (2009) "*In Vivo* Quantification of Human Coronary Artery Deformation from Cardiac-Gated Computed Tomography Data," *2009 ASME Summer Bioengineering Conference.*
9) Suh, G.K., Tenforde, A., Shadden, S., Spilker, R., **Cheng, C.P.**, Herfkens, R.J., Dalman, R.L., Taylor, C.A. (2009) "Hemodynamics in Abdominal Aortic Aneurysms at Rest and Graded Levels of Exercise," *2009 ASME Summer Bioengineering Conference.*
10) **Cheng, C.P.**, Choi, G., Cukur, T. (2008) "Tibial Artery Biomechanics," *2008 Stent Summit at the Cleveland Clinic*, Invited Faculty.
11) Choi, G., Shin, L.K., Taylor, C.A., **Cheng, C.P.** (2008) "Quantification of the Deformation of the Human Iliac Arteries with Hip and Knee Flexion: Implications for Stent-Graft Design," *2008 ASME Summer Bioengineering Conference*.
12) **Cheng, C.P.** (2008) "Carotid Artery Deformations Due to Musculoskeletal Motion and Comparisons with Other Anatomies," *2008 ASTM Fatigue and Fracture of Medical Metallic Materials and Devices*, Invited Faculty.
13) **Cheng, C.P.** (2008) "The Dynamic Environment of the SFA," *2008 Society of Interventional Radiology Annual Scientific Meeting*, Invited Faculty.
14) Choi, G., Wilson, N.M., **Cheng, C.P.**, Herfkens, R.J., Taylor, C.A. (2008) "Quantification of the *In Vivo* Kinematics of the Superficial Femoral Artery Due to Hip and Knee Flexion Using Magnetic Resonance Imaging," *16th International Society for Magnetic Resonance in Medicine*, Abstract #2062.
15) Tenforde, A., **Cheng, C.P.**, Suh, K.Y., Les, A.S., Dalman, R.L., Herfkens, R.J., Taylor, C.A. (2008) "Hemodynamic Response to Exercise in Small Aortic Aneurysms," *16th International Society for Magnetic Resonance in Medicine*, Abstract #1970.
16) **Cheng, C.P.**, Robertson, S.W. (2007) "Non-Pulsatile Carotid Artery Biomechanics," *2007 Stent Summit at the Cleveland Clinic*, Invited Faculty.
17) Cao, E., **Cheng, C.P.** (2007) "*In Vivo* 3D Deformations of the Human Iliac Artery Due to Hip Flexion," *2007 Transcatheter Therapeutics Conference*, Abstract #587
18) Choi, G., **Cheng, C.P.**, Wilson, N.M., Taylor, C.A. (2007) "Methods for Quantifying Vessel Deformation Due to Pulsatile and Non-Pulsatile Forces," *2007 ASME Summer Bioengineering Conference*.

19) Les, A.S., **Cheng, C.P.**, Draney Blomme, M.T., Figueroa, C.A., LaDisa, J.F., Park, J.M., Herfkens, R.J., Dalman, R.L., Taylor, C.A. (2007) "Hemodynamics in Abdominal Aortic Aneurysms During Rest and Simulated Exercise," *2007 ASME Summer Bioengineering Conference*.
20) **Cheng, C.P.**, Choi, G., Suh, G., Donovan, F.D., Herfkens, R.J., Taylor, C.A. (2006) "*In Vivo* Axial and Twisting Deformations of the Superficial Femoral Artery Due to Hip and Knee Flexion: The RESIStent Consortium Experience," *2006 Transcatheter Therapeutics Conference,* Abstract #2616.
21) Choi, G., **Cheng, C.P.**, Suh, G., Donovan, F.D., Herfkens, R.J., Taylor, C.A. (2006) "Quantification of Radial Compression and Deflection of the Superficial Femoral Artery Due to Musculoskeletal Motion," *2006 Transcatheter Therapeutics Conference,* Abstract #258.
22) **Cheng, C.P.** (2006) "Arterial Biomechanics for Vascular Implants," *Complications Conference, Jackson Hole, WY*
23) **Cheng, C.P.** (2006) "Functional Vascular Imaging for Medical Devices," *2006 Society for Medical Innovation and Technology (SMIT) Conference*
24) Fonte, T.A., **Cheng, C.P.**, Spilker, R.L., Taylor, C.A., Feinstein, J.A. (2005) "Patient-Specific 3-Dimensional Computational Models Quantifying Central, Lobar and Segmental Pulmonary Artery Hemodynamics with Morphometric Representation of Distal Vessels" *2005 American Heart Association Conference*
25) **Cheng, C.P.**, Wilson, N.M., Herfkens, R.J., Taylor, C.A. (2005) "*In Vivo* Deformations of the Superficial Femoral Artery – Possible Cause of Stent Fractures?" *2005 ASME Summer Bioengineering Conference*.
26) Song, B.P., Bennett, N.R., **Cheng, C.P.**, Fahrig, R., Wilson, N.M., Taylor, C.A. (2005) "Methods for Imaging and Quantifying Stent Deformation in the Superficial Femoral Artery," *2005 ASME Summer Bioengineering Conference*.
27) **Cheng, C.P.**, Wilson, N.M., Herfkens, R.J., Taylor, C.A. (2005) "Superficial Femoral Artery Deformations Due to Maximal Hip and Knee Flexion: Implications for Stent Design," *13th International Society for Magnetic Resonance in Medicine*, Abstract #272.
28) **Cheng, C.P.**, Herfkens, R.J., Taylor, C.A., Feinstein, J.A. (2004) "*In Vivo* Blood Flow Characteristics in the Proximal Pulmonary Arteries of Healthy Children and Adults at Seated Rest and During Cycling Exercise," *12th International Society for Magnetic Resonance in Medicine*, Abstract #557.
29) **Cheng, C.P.**, Herfkens, R.J., Taylor, C.A., Feinstein, J.A. (2004) "Upright Seated Pulmonary and Caval Blood Flow Characteristics During Rest and Cycling Exercise Using Magnetic Resonance Imaging," *53rd Annual Scientific Session of the ACC, Supplement to JACC*, 43(5): p. 396A.
30) **Cheng, C.P.**, Herfkens, R.J., Feinstein, J.A., Taylor, C.A. (2003) "*In Vivo* Quantification of Large Vessel Hemodynamics Using Exercise-Stress Magnetic Resonance Imaging," *International Bio-Fluid Symposium and Workshop*.
31) **Cheng, C.P.**, Herfkens, R.J., Feinstein , J.A., Taylor, C.A. (2003) "*In Vivo* Quantification of Abdominal Aortic Hemodynamic Conditions at Rest and During Cycling Exercise in Healthy Subject Aged 50-70," *11th International Society for Magnetic Resonance in Medicine*, Abstract #150.
32) **Cheng, C.P.**, Herfkens, R.J., Dalman, R.L., Coogan, S.M., Taylor, C.A. (2003) "*In Vivo* Abdominal Aortic Hemodynamic Conditions at Rest and During Cycling Exercise in Young Healthy Subjects, Older Healthy Subjects, and Intermittent Claudication Patients," *Proceedings of the 2003 ASME Summer Bioengineering Conference*, p. 815-816.
33) Tang, B.T., **Cheng, C.P.**, Draney, M.T., Tsao, P.S., Taylor, C.A. (2003) "Subject-Specific Finite Element Modeling of 3D Pulsatile Flow in the Human Abdominal Aorta: Comparison of Resting and Simulated Exercise Conditions," *Proceedings of the 2003 ASME Summer Bioengineering Conference*, p. 165-166.
34) **Cheng, C.P.** (2001) "*In Vivo* Quantification of Hemodynamic Conditions in the Human Abdominal Aorta at Rest and During Lower Limb Exercise," *2001 Annual Whitaker Conference*.
35) **Cheng, C.P.**, Parker, D., Taylor, C.A. (2001) "Wall Shear Stress Quantification from Magnetic Resonance Imaging Data Using Lagrangian Interpolation Functions," *Proceedings of the 2001 ASME Summer Bioengineering Conference*, p. 795-796. (Ph.D. Student Paper Competition winner)
36) Taylor, C.A., **Cheng, C.P.** (2001) "Hemodynamic Conditions in the Human Abdominal Aorta at Rest and During Exercise," *2001 Society of Vascular Surgeons Conference*.
37) **Cheng, C.P.**, Espinosa, L., Tang, B., Herfkens, R.J., Taylor, C.A. (2000) "*In vivo* Quantification of Blood Flow Distribution and Shear Stress in the Abdominal Aorta at Rest and During Lower Limb Exercise," *Annals of Biomedical Engineering, Volume 28 Supplement 1*, S-67.
38) **Cheng, C.P.** and Taylor, C.A. (1999) "A Computational Study of the Effect of Femorofemoral Bypass Graft Diameter on Hemodynamic Conditions," *Proceedings of the 1999 ASME Summer Bioengineering Conference*, p. 191-192.