BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: Paul Gordon Yock, MD

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

POSITION TITLE: Martha Meier Weiland Professor of Medicine, Founding co-chair of Stanford Department of Bioengineering, with courtesy appointment in the Department of Mechanical Engineering. He is the Founder and Director of Stanford Biodesign

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 *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
Amherst College, MA	AB	1969-73	Philosophy/Chemistry
Trinity College, Oxford, U.K.	MA	1973-75	Philosophy/Phys.
Harvard Medical School, Boston MA	MD	1975-79	Medicine
University of California at San Francisco	Intern/Res	1979-82	Medicine
Stanford University Medical Center, CA	Fellow	1982-1985	Cardiology

A. Personal Statement

I have substantial personal experience as an inventor and translator of technologies, holding over 50 U.S. patents for medical devices. Some of the technologies I have developed have had large-scale patient impact. For example, the “rapid exchange” angioplasty/stenting system which I invented is the primary technology in use worldwide, having treated over 30 million patients. I also invented the mechanical approach to intravascular ultrasound imaging (IVUS) a technology that has also been widely deployed clinically (over 2 million patients). In 2000 I founded the Stanford Biodesign Program, which to date has trained 151 innovation postdoctoral fellows, 2,100 Stanford engineering and medicine graduate students in the process of medical technology innovation, 48 Global fellows and 50 faculty fellows. My former advisees have obtained high-level positions in industry and academia. This program has resulted in a number of patents, 50 start-up companies (from the trainees) and, so far, over 2,700,000 patients treated with technologies originating from the program. I am the senior editor of the textbook Biodesign: the Process of Innovating Medical Technologies, which is the leading text in the area of medical technology innovation. In summary, I am highly focused on understanding and facilitating the processes of inventing and translating medical technologies which has direct relevance to this project. I am excited to participate as a mentor in the proposed T32 training program.

B. Positions and Honors

Positions and Employment:

1986-1994	Assistant and Associate Professor of Medicine (Cardiology), UC-San Francisco
1994-1998	Associate Professor of Medicine (Cardiovascular), Stanford University
1998-present	Professor of Medicine (Cardiovascular)
1999-present	Professor of Mechanical Engineering (By courtesy)
1999-2018	Professor of Business (By courtesy)
2001-present	Director, Stanford Biodesign
2003-2006	Founding Co-Chair, Department of Bioengineering

Other Experience and Professional Memberships: (selected)
Fellow, American College of Cardiology
Fellow, American Institute for Medical and Biological Engineering
Editorial Advisory Boards, *Circulation, J of the American College of Cardiology, American Heart J*
Founder, Cardiovascular Imaging Systems (Boston Scientific), Venomatrix, Neodyne.

Honors: (recent, selected)

2006 Transcatheter Therapeutics (TCT) Career Achievement Award
2008 Dr Sci (honoris causa) Amherst College
2008 American College of Cardiology Distinguished Scientist Award
2009 Member, National Academy of Engineering
2010 Career Achievement, Cardiovascular Research Institute (Columbia Univ.)
2018 National Academy of Engineering's 2018 Bernard M. Gordon Prize for Innovation in Engineering and Technology Education
2019 National Academy of Engineering Fritz J. and Dolores H. Russ Prize for outstanding bioengineering achievement that improve the human condition

C. Contributions to Science

1. **Initial clinical studies on Doppler echocardiogaphy**
   Lead author on the initial paper on non-invasive estimation of right-heart pressures using Doppler ultrasound; also the first study characterizing the abnormal flow patterns in hypertrophic cardiomyopathy. These are now standard clinical techniques in echocardiography.

   Yock PG, Popp RL. Noninvasive estimation of right ventricular systolic pressure by Doppler ultrasound in patients with tricuspid regurgitation. Circulation, 70: 657-662, 1984.

   Yock PG, Hatle L, Popp RL, Patterns and timing of Doppler-detected intracavitary and aortic flow in hypertrophic cardiomyopathy. J Am Coll Cardiol., 8: 1047-58, 1986.

2. **Invention and initial clinical validation of intravascular ultrasound (IVUS)**
   Sole inventor for the fundamental patents in intravascular ultrasound imaging; performed the preclinical and initial clinical studies; characterized the normal and pathophysiologic features of arterial wall morphology; characterized the effects of atherectomy and stenting using IVUS

   Yock P. Catheter system apparatus and method for vascular ultrasonography.
   Issued January 3, 1989; US patent no. 4,794,931

   Fitzgerald PJ, Ports TA, **Yock PG**. Contribution of localized calcium deposits to dissection after angioplasty: An observational study using intravascular ultrasound. Circulation, 86(1): 64-70, 1992.

   Fitzgerald PJ, St. Goar FG, Connolly AJ, Pinto FJ, Billingham ME, Popp RL, **Yock PG**. Intravascular ultrasound imaging of coronary arteries: Is three layers the norm? Circulation, 86(1): 154-158, 1992.

   Hausmann D, Erbel R, Alibelli-Chemarin MJ, Boksch W, **Yock PG**. The safety of intracoronary ultrasound: A multi-center survey of 2207 examinations. Circulation, 91(3): 623-30, 1995.

3. **Invention of rapid exchange coronary angioplasty and stenting system.**
   Sole inventor of the rapid exchange system, now the predominant system in use world-wide, (with tens of millions of patients treated)

   Yock P. Angioplasty method. Issued August 20, 1991; US patent no. 5,040,548.

4. **Development of the Biodesign training program and methodology**
Founded the Stanford Biodesign Program, which has developed a stepwise training methodology for biomedical technology innovation. 140 fellows trained to date, several hundred patents, 38 companies formed.

Yock, P, Zenios S, Makower J, senior editors: *Biodesign: The Process of Innovating Medical Technologies*. New York: Cambridge University Press, 2015. 839 pp.

Yock, PG, Brinton Todd J, Zenios, Stefanos A. Teaching biomedical technology innovation as a discipline. Sci. Transl. Med 3(92): 92-109, 2011.

Brinton TJ, Kurihara CQ, Camarillo DB, Pietzsch JB, Gorodsky J, Zenios SA, Doshi R, Shen C, Kumar U, Mairal A, Watkins J, Popp RL, Wang PJ, Makower J, Krummel TM, **Yock PG**. Outcomes from a postgraduate biomedical technology innovation training program: The first 12 years of Stanford Biodesign. Annals of Biomedical Engineering, 41(9): 1803-1810, 2013.

D. Additional Information: Research Support and/or Scholastic Performance

Singapore Government Grant Phase II Yock (PI) 2013-2021
Singapore-Stanford Biodesign Program II from Agency for Science, Technology and Research (A*STAR)
The goal is to create a new biomedical technology educational and fellowship initiative linking the Singapore Agencies and Stanford. Role: PI

Completed Research Support

Abbott Laboratories Grant Yock (PI) 2014-2018 Phase II
Manage and support the operations of the Biodesign program including running the Biodesign Innovation Fellowship. Role: PI

1 RC4 TW008781-01 Barry (PI) 2010 - 2014
Stanford Global Health Consortium: Innovation, Design, Evaluation and Action (C-IDEA) National Institutes of Health (NIH) This C-IDEA grant will create an innovative, collaborative environment that will focus the intellectual talents and enthusiasm of Stanford students, fellows, and faculty from the Schools of Medicine, Engineering and Business to provide exciting and viable solutions to the global health needs of the developing world. Role: Co-Investigator

Singapore Government Grant Yock (PI) 2010-2012 Phase I
Singapore-Stanford Biodesign Program II from Agency for Science, Technology and Research (A*STAR) The goal is to create a new biomedical technology educational and fellowship initiative linking the Singapore Agencies and Stanford. Role: PI

1UL1 RR025744-01 Greenberg (PI) 2008-2013
Center for Clinical and Translational Education & Research NIH
The purpose of this grant is to help speed up the time it takes for basic science discoveries to be translated into new and more effective treatments for patients. Role: Co-Investigator

Abbott Laboratories Grant Phase II Yock (PI) 2008-2013
Manage and support the operations of the Biodesign program including running the Biodesign Innovation fellowship. Role: PI