

# Carol A. Gibbons Kroeker

## Curriculum Vitae

### I. BIOGRAPHICAL DATA

Name: CAROL A. (GIBBONS) KROEKER  
Email: kcagibbo@ucalgary.ca

Present Rank: Assistant Professor, Teaching - Faculty of Nursing, University of Calgary

Adjunct Professor in Medicine  
Dept. of Cardiac Sciences / Dept. of Physiology and Pharmacology  
Cumming School of Medicine  
University of Calgary

Sessional Instructor - Anatomy and Physiology  
Faculty of Kinesiology, University of Calgary

### II. ACADEMIC RECORD

Final Degree : **PhD**  
Completed : 1994  
Specialty: Cardiovascular Physiology  
Institution: University of Calgary, Calgary, Canada

#### i. Undergraduate

##### **Bachelor of Science**

1986

**Major** : Zoology, **Major** : Pure Math, **Minor** : Applied Math  
University of Calgary (Departments of Math and Biology)

#### ii. Graduate and Post-doctoral

##### **Master of Science** 1990

**Specialization**: Physiology / Biomechanics

**Thesis Title**: Mechanical Design in the Arterial System of the toad, Bufo marinus  
University of Calgary (Department of Biology)

##### **Doctor of Philosophy**

1994

**Specialization**: Cardiovascular Physiology

**Thesis Title**: The Dynamics of Left Ventricular Torsion throughout the Cardiac Cycle  
University of Calgary (Faculty of Medicine)  
(Graduate Traineeship Award – Heart and Stroke Foundation of Canada)

### **Post-doctoral Fellowship**

2000-2005

**Specialization:** Cardiovascular Physiology and Biomedical Engineering

**Areas of Research:** Pericardial Mechanics, Finite Element Modelling, Coronary perfusion  
University of Calgary (Faculties of Medicine and Engineering)  
(Post-doctoral Research Fellowship – Natural Science and Engineering Research Council)

### **Faculty Teaching Certificate**

2005

University of Calgary Learning Commons

Focus on Under-graduate and Graduate level teaching

## **III. AWARDS AND DISTINCTIONS:**

**2022** – Inducted into the Teaching Excellence Hall of Fame, University of Calgary Student’s Union

**2022-2024** – Teaching and Learning Grant – Taylor Institute, University of Calgary  
“Development of Video-based Case Studies in Anatomy and Physiology”

**2020/2021** – Teaching Excellence Award, University of Calgary Student’s Union

**2020/2021** – Taylor Institute Faculty Teaching Award. University of Calgary

**2019/ 2020** – Teaching Excellence Award, University of Calgary Student’s Union

**2016/17** – Nominated for a Teaching Excellence Award, University of Calgary Student’s Union

**2015/16** – Nominated for a Teaching Excellence Award, University of Calgary Student’s Union

**2015/16** – Nominated for a Faculty Teaching Award in the Sessional Category

**2014/2015** – Nominated for a Faculty Teaching Award – Sessional Category

**2014/2015** – Teaching Excellence Award, University of Calgary Student’s Union

**2012/13** – Teaching Excellence Award, University of Calgary Student’s Union.

## **IV. EDUCATIONAL ACTIVITIES**

### **i. Undergraduate and Graduate**

**2021-present** – **Assistant Professor - Teaching**, Faculty of Nursing, University of Calgary  
Anatomy and Physiology

**2011-present** – **Sessional Instructor** - Faculty of Kinesiology, University of Calgary

#### **Courses taught:**

**KNES 323 – Integrative Physiology** – Instructor / Course Co-ordinator (annual since 2011)

This includes delivery of all lectures as well as all administrative duties, supervision of TA’s and lab technicians, development of lecture and lab material (270 students per fall term). This also included initial course development of both lectures and laboratory materials. (270 students)

**KNES 260 - Anatomy and Physiology II** (Annually 2012, 2014 - )

Developed and taught all physiology lectures (500 students)

**KNES 259 – Anatomy and Physiology I** (Annually, Fall 2014-)

Developed and taught all the physiology lectures (500 students)

**KNES 495 – Physiological Aspects of Aging, Disease and Exercise** (Winter 2018)

Developed and taught all the lectures (160 students)

**2019 - 2021 - Sessional Instructor** – Dept. of Biological Sciences, Faculty of Science , University of Calgary

**Courses Taught:**

**BIOL 297 – The Ultimate Machine – the Human Body in exercise, disease and Extreme environments**

A new course that I designed and developed, including the use of case studies and inquiry-based learning. (80 students)

**BIOL 305 – The Human Organism**

This non-majors Biology course focuses on Human Physiology and General Biology (150 students)

**2019- 20 – Group Study Tutor**– Athabasca University, Faculty of Science

Courses Taught:

**BIOL 235 - Anatomy and Physiology I and II**

**2020- Academic Expert and Marker** – Athabasca University

Courses

**BIOL 230 and 235 – Human Physiology, Anatomy and Physiology**

**2005 – 2018 : Biology Program Chair, Associate Professor, Ambrose University.  
Achieved Tenure in 2011**

**Duties:** The development of the Biology degree program at the University

- Wrote the initial Biology degree proposal and oversaw its development from the start of the program to 2018 (program grew to 170 biology students under my leadership)
- Writing proposals to CAQC (Campus Alberta Quality Council)
- Development of courses and lab programs
- Supervising 12 faculty members and 14 lab TA's within the Science department
- Administrative tasks  
(budgets, ordering of equipment, Class schedules, faculty and staff hiring, etc.).
- Committees including Academic Affairs, Academic Planning, and Animal Care
- Student advising and Faculty advising and evaluations

**Courses taught:**

- Zoology 261 and 263 (Human Physiology), taught yearly
- Zoology 361 (Pathophysiology) – taught biennially
- Zoology 265 (Human Anatomy) - biennial
- Zoology 323 (Integrative Physiology) - biennial
- Kinesiology 335 (Sports Injuries and Rehabilitation) - biennial
- Kinesiology 201 (Introduction to Kinesiology) - yearly
- Medical Science 231 (Medical Terminology) – on-line course, annual
- Biology 425 (Epidemiology) – reading course - annual
- Biology 131 and 133 (Introductory Biology) - yearly
- Zoology 277 (Comparative Vertebrate Anatomy), occasional (5 iterations)
- Zoology 275 (Invertebrate Zoology), occasional (5 iterations)
- Biology 213 (Ecology), occasional (4 iterations)
- Biology 105 (Human Biology for non-majors), (3 iterations)
- Zoology 379 (Marine Biology) – biennial – Bamfield Marine Station
- Kinesiology 385 (Biomechanics) - biennial
- Ecology 389 (Conservation Ecology) - travel trip - biennial

This includes development of the lab portions for these courses, writing lab manuals, and teaching labs.

**2012-present – Instructor** – Med Science – Cardiology Sessions (Faculty of Medicine, University of Calgary) – Developed and taught a new set of tutorials for the first year medical students in the Cardiology unit. These were developed as a result of student feedback asking for a more hands-on approach to cardiovascular physiology.

**2012-2016 – Guest Instructor**, MDSC 629 – Graduate course in Cardiovascular Physiology, Faculty of Medicine, University of Calgary. This includes providing lectures and marking of term papers and exams.

**2007-2016 – Guest Instructor** - BMEN 601 and BMEN 611 (Graduate course in Biomedical Engineering offered through the Department of Biomedical Engineering, University of Calgary).

**2003 - present Speaker**, Canadian Medical Hall of Fame Discovery Days. Giving lectures and workshops to groups of students excelling at the high school level and interested in possible careers in Medicine and research.

**1998-2009, Guest Instructor**, Faculty of Medicine, University of Calgary. Giving guest lectures in the field of Cardiovascular physiology to Medical students, Nursing students, and Graduate students.

**2003-2007 Instructor**, Practical Nursing Program, Bow Valley College. Teaching introductory Anatomy and Physiology. This includes giving lectures, marking assignments and exams, as well as providing one-on-one tutoring and support to the students.

**1993 - 1999 : Sessional Instructor** in the Department of Chemistry, Biology, and Environmental Technology at Mount Royal College, Calgary.

**Courses taught:** Zoology 3361 and 3363 (Human Physiology – full year),  
Biology 1216 (Human Physiology for kinesiology majors (1216))

**Duties:** taught lectures, labs and tutorials and designing course curriculum, as well as marking exams and lab reports. In 1997, the summer was spent writing a new lab manual for both Zoology 3361 and Zoology 3363, including design of new experiments.

### **Supervisory Experience:**

#### **Teaching:**

**2005-2018**

- Supervising and mentoring the Science Faculty and TA's at Ambrose University

**2011-present**

- Supervising and mentoring graduate TA's in the integrative Physiology course, University of Calgary
- Supervisory committee for Masters' students in Kinesiology and Medicine

#### **Research:**

**2010-present** – Research Advisor for year-long undergraduate student research projects at Ambrose University

- Projects in cardiovascular physiology, biomechanics, kinesiology, vertebrate anatomy, and biopsychology
- This includes mentoring and the development of the project, supervising the research and statistical analysis, as well as mentoring for the final presentation and paper, and assessment of the projects
- Have supervised 26 students in this capacity – several of these students have gone on to graduate school or professional schooling

**2014- present** – Mentor for graduate students within a research lab in Faculty of Medicine, University of Calgary

- Included help with experiments and analysis, as well as critical review of research for presentations and dissertations.

ii. Other Teaching and Leadership Experience

**2009- present** – Provincial Representative for the National Association of Biology Teachers.

**2017 – pre.** **ACAT Chair for Biology Articulation committee** – Alberta Council on Admissions and Transfer

**2017-** **UBEA Board Member at Large** – University Biology Educators of Alberta

**2015–17** **ACAT Vice-Chair for Biology Articulation committee** – Alberta Council on Admissions and Transfer

**2022** – pres.- Public Member / Vice-Chair, Alberta College of Dental Hygienists, Alberta Health Services (3 year appointment).

**Occasional Responsibilities:**

Editorial review board for the American Journal of Physiology – Heart and Circulation

Editorial review board for the Canadian Journal of Cardiology

Reviewer for Freeman Publishing – Physiology, Zoology, and General Biology chapters

Reviewer for Pearson Publishing – Human Anatomy and Physiology

iii. Volunteer Experience

**2022 – External Reviewer** – St. Mary’s University Cyclical review of the Biology Program

**2003 – present:** Mentor for the Discovery Days program. Work on Career Panels, do volunteer work and lectures with high school students on careers in research and medicine and teaching

**2003-present :** Student mentoring programs – Operation Minerva (mentoring to Junior High Girls interested in science) as well as Discovery programs. Work with the Alberta Women’

**2001- present** – Volunteer Judge at the Calgary Youth Science Fair.

**2013 - present - Awards Judge** – Life Sciences – Medical Division

**IV. PROFESSIONAL ACTIVITIES**

i. Society Memberships

<b>2003 – 2010</b>	Cardiovascular System Dynamics Society
<b>2003 -</b>	American Physiological Society
<b>2002 -2020</b>	American Heart Association
<b>2002 -</b>	Alberta Biomedical Engineering Society
<b>2005-</b>	National Association of Biology Teachers
<b>1997 -98, 2005-</b>	Association of Biological Laboratory Educators
<b>2008 - 2020</b>	Canadian Physiological Society
<b>2008 -</b>	ACUBE – Association of College and University Biology Educators
<b>2007 -</b>	NSTA – National Science Teachers Association
<b>2009 -</b>	HAPS – Human Anatomy and Physiology Society
<b>2013-</b>	UBEA – University Biology Educators of Alberta
<b>2013 -</b>	AAAS – American Association for the Advancement of Science
<b>2014-</b>	American College of Nutrition
<b>2018-</b>	American College of Sports Medicine

## CURRENT RESEARCH INTERESTS

My latest research work involves using Wave Intensity Analysis to study blood flow patterns and wave reflections within mammalian circulations. We're using dog, pig, and sheep models to study blood pressure and flow changes within the arterial circulation with vasodilation (nitroprusside) and vasoconstriction (phenylephrine).

I am also working on several projects in the field of Cardiac Mechanics. One project is a collaboration with U of Alberta researchers – measuring ventricular torsion and comparing it to measurements using 3-D Echocardiography and speckle-tracking. In a separate project, I'm using a microsphere technique to measure coronary blood flow changes under ischemic conditions as well as with drug-induced changes. We are using the microsphere technique to evaluate the accuracy to MRI flow measurements.

I am also using my positions at Ambrose University (former) and the University of Calgary to develop studies in educational practices within physiology and biology. This has included a comparison of large and small class sizes to student outcomes, as well as the use of cardiovascular case studies.

## VI. PUBLICATIONS:

### ii. Peer-Reviewed Manuscripts:

Carol A Gibbons Kroeker. Does size really matter? A comparison of class size and student outcomes in Introductory Physiology Courses, Submitted to *Advances in Physiological Education*.

Santokh S Dhillon MD, Nee Sze Khoo MD, Timothy Colen MBBS, John V Tyberg MD PhD, Carol A. Gibbons Kroeker PhD, Jeffrey F. Smallhorn MBBS. A Novel insight Into the Effect of Loading Conditions and Contractility on Mitral Valve Function. Submitted to *Journal of Echocardiography*.

Joseph J Pagano, John V. Tyberg, Carol A. Gibbons Kroeker, Cynthia L Trevenen, Deborah S. Fruitman, and Jeffrey F. Smallhorn. Identification of the Mitral Valve Chordal apparatus using high-resolution, full-volume, real-time 3D Echocardiography. Submitted to *Journal of Echocardiography*.

Mishra, RC\*, Mitchell JR\*, Gibbons-Kroeker C, Wulff H, Belenkie I, Tyberg JV, Braun AP. A Pharmacologic Activator of Endothelial K<sub>Ca</sub> Channels Increases Systemic Conductance and Reduces Arterial Pressure in an Anesthetized Pig Model. *Vascular Pharmacology*. 79: 24-31, 2016. \* Co-first authors.

Muhammad Ashraf, Andriy Myronenko, Thuan Nguyen, Akio Inage, Wayne Smith, Robert I. Lowe, Karl Thiele, Carol A. Gibbons Kroeker, John V. Tyberg, MD, PhD, Jeffrey F. Smallhorn, David J. Sahn, Xubo Song; Defining Left Ventricular Apex-to-Base Twist Mechanics Computed From High-Resolution 3D Echocardiography: Validation Against Sonomicrometry. *J Am Coll Cardiol Img*, 2010; 3:227-234.

N. G. Shrive, C. A. Gibbons-Kroeker, J. V. Tyberg, C. B. Frank, G. M. Thornton, S. M. Adebé Modeling and Experiments to Understand Tissue Function Published in *Society of Experimental Mechanics Journal* and presented in June, 2009 at the World Congress of Biomechanics.

Ashraf Muhammad; Myronenko Andriy; Nguyen Thuan; Inage Akio; Smith Wayne; Lowe Robert I; Thiele Karl; Gibbons Kroeker Carol A; Tyberg John V; Smallhorn Jeffrey F; Sahn David J; Song Xubo Defining left ventricular apex-to-base twist mechanics computed from high-resolution 3D echocardiography: validation against sonomicrometry. *JACC. Cardiovascular imaging*, Vol: 3, Issue: 3, Jan., 2010, p 227-235

- Gibbons Kroeker, Carol A., Samer Adeeb, Nigel G. Shrive, and John V. Tyberg. Compression Induced by RV Pressure Overload Decreases Regional Coronary Blood Flow in Anesthetized Dogs. *American Journal of Physiology , Heart Circ. Physiol.* 290: H2432-H2438, 2006.
- Gibbons Kroeker, Carol A., Samer Adeeb, John V. Tyberg, and Nigel G. Shrive. A 2-D Hyperelastic Finite Element Model of the Heart under Normal and Abnormal Loading. *American Journal of Physiology , Heart Circ. Physiol.* 291: H2229-H2236, 2006.
- Gibbons Kroeker, Carol A., Nigel G. Shrive, Israel Belenkie, and John V. Tyberg. The Pericardium modulates LV and RV Stroke Volumes to Compensate for Sudden Changes in Cardiac Volume. *Am. J. Physiol. Heart Circ. Physiol.* 284: H2247-H2254 (2003).
- Nelson GS, Sayed-Ahmed EY, Kroeker CA, Sun YH, Keurs HE, Shrive NG, Tyberg JV. Compression of interventricular septum during right ventricular pressure loading. *Am J Physiol Heart Circ Physiol.* 2001 Jun;280(6):H2639-48.
- Gibbons Kroeker, Carol A., John V. Tyberg, and Rafael Beyar. The Effects of Ischemia on Left Ventricular Apex-rotation: An experimental study in anaesthetized dogs. *Circulation*, 1995: 92, 3539-3548.
- Gibbons Kroeker, Carol A., John V. Tyberg, and Rafael Beyar. The Effects of Load manipulation, heart rate, and contractility on Left Ventricular apical rotation: An experimental study in anaesthetized dogs. *Circulation*, 1995: 92, 130-141.
- Beyar, Rafael, Riva Ben-ari, Carol A. Gibbons Kroeker, John V. Tyberg, and Samuel Sideman. The effect of interconnecting collagen fibres on LV function and intramyocardial compression. *Cardiovascular Research*, 1993.
- Gibbons Kroeker, Carol A., H.E.D.J. ter Keurs, Merrill L. Knudtson, John V. Tyberg, and Rafael Beyar. An Optical Device to Measure the Dynamics of Apex Rotation of the Left Ventricle. *American Journal of Physiology*, 1993: 265, H1444-H1449.
- Gibbons (Kroeker), Carol A., and Robert E. Shadwick. Circulatory Mechanics in the Toad, *Bufo marinus*. I. Structure and Mechanical Design of the Aorta. *Journal of Experimental Biology*, 158: 275-289, 1991.
- Gibbons (Kroeker), Carol A., and Robert E. Shadwick. Circulatory Mechanics in the Toad, *Bufo marinus*. II. Haemodynamics of the Arterial Windkessel. *Journal of Experimental Biology*, 158: 291-306, 1991.
- Gibbons (Kroeker), Carol A., and Robert E. Shadwick. Functional similarities in the mechanical design of the aorta in lower vertebrates and mammals. *Experientia*, 45: 1083-1088, 1089.

### **iii. Books, Theses, Chapters**

- Gibbons Kroeker, Carol A. Cardiovascular Physiology, A chapter in a textbook “Cardiovascular Mechanics”, edited by Michel LaBrosse, Publisher: CRC publishing, 2018.
- Gibbons Kroeker, Carol A. Zoology 3361/3363 Lab Manual for Human Physiology. Mount Royal College, Calgary. 1997.
- Gibbons Kroeker, Carol A. The Dynamics of Left Ventricular Torsion Throughout the Cardiac Cycle. Ph.D.

thesis, 1994.

Gibbons (Kroeker), Carol A. Mechanical Design in the Arterial System of the Toad, *Bufo marinus*. M.Sc. thesis, 1990.

iii. **Abstracts - Published**

Carol A. Gibbons Kroeker. Cheat Sheets – are they the best – kept secret Weapon. Proceedings from the UBEA conference, 2023. University Biology Educators of Alberta.

Carol A. Gibbons Kroeker. Does size really matter? A comparison of class size and student outcomes in Introductory Physiology Courses. Proceedings from the 2017 Experimental Biology Conference, Chicago, 2017.

Muhammad Ashraf, Xubo Song, Andriy Myronenko, Wayne Smith, Karl Thiele, Akio Inage, Carol Gibbons Kroeker, John Tyberg, Jeffrey Smallhorn, and David Sahn. A Newly Developed Method Computes Cardiac Torsion from 4-Dimensional Ultrasound Data. *Circulation Supplement*, Nov. 2008. Proceeding for the American Heart Association Scientific Sessions, 2008.

Gibbons Kroeker, Carol A., Samer Adeeb, Nigel G. Shrive, and John V. Tyberg. Compression Induced by RV Pressure Overload Decreases Regional Coronary Blood Flow in Anesthetized Dogs. *Circulation Supplement*, Nov. 2004. Proceeding for the American Heart Association Scientific Sessions, 2004.

Gibbons Kroeker, Carol A., Samer Adeeb, Nigel G. Shrive, and John V. Tyberg. A Hyperelastic 2-D Finite Element Model of the Heart – Some Implications for Coronary Perfusion. *Canadian Journal of Cardiology*, October, 2004. Proceedings for the Canadian Cardiovascular Congress, 2004.

Gibbons Kroeker, Carol A., Samer Adeeb, Nigel G. Shrive, and John V. Tyberg. A Hyperelastic 2-D Finite Element Model of the Heart – Some Implications for Coronary Perfusion. Proceedings for the Cardiovascular System Dynamics Society, 2004.

Gibbons Kroeker, Carol A., Nigel G. Shrive, and John V. Tyberg. The Pericardium Modulates LV and RV Stroke Volumes to Compensate for Sudden Changes in Cardiac Volume. Proceeding of the XV Congress of the Cardiovascular System Dynamics Society. Sendai, Japan, Oct., 2002.

Gibbons Kroeker, Carol A., Samer Adeeb, John V. Tyberg, and Nigel G. Shrive. A 2-D Hyperelastic Finite Element Model of the Heart under Normal and Abnormal Loading. Proceeding of the International Symposium for Cardiovascular Remodelling and Function. Osaka, Japan. Oct., 2002.

Gibbons Kroeker, Carol A., Samer Adeeb, John V. Tyberg, and Nigel G. Shrive. A 2-D Hyperelastic Finite Element Model of the Heart Under Normal and Abnormal Loading, *Circulation, Suppl. D*. Nov. 2002.

Gibbons Kroeker, Carol A., Nigel G. Shrive, and John V. Tyberg. The Pericardium Modulates LV and RV Stroke Volumes to Compensate for Sudden Changes in Cardiac Volume. Proceeding of the IV World Congress of Biomechanics. Aug. 2002.

Gibbons Kroeker, Carol A., Samer Adeeb, John V. Tyberg, and Nigel G. Shrive. A 2-D Hyperelastic Finite Element Model of the Heart under Normal and Abnormal Loading. Proceeding of the IV World Congress of Biomechanics. Aug. 2002.

Gibbons Kroeker, Carol A., John V. Tyberg, and Nigel G. Shrive. A 2-D Hyperelastic Model of the Heart Under Normal and Abnormal Loading. *Comp. Methods in Biomechanics, and Biomedical Engineering*. Suppl., Nov.

2001.

Gibbons Kroeker, Carol A., Nigel G. Shrive, and John V. Tyberg. Pericardium-mediated Equalization of Left and Right Ventricular Outputs. *Circulation, Suppl D.*, Nov. 2001.

Gibbons Kroeker, Carol A., Nigel G. Shrive, and John V. Tyberg. Pericardium-mediated Equalization of Left and Right Ventricular Outputs. *Can. J. Cardiol.* Vol 17, Suppl C., Sept. 2001, p241C (abst.).

Beyar R., C.A. Gibbons Kroeker, M.L. Knudtson, H.E.D.J. ter Keurs, and J.V. Tyberg. The dynamics of left ventricular apical twist : Measurements in dogs and patients. *Heart and Vessels*, 1992, S8:16. (abst.).

Gibbons (Kroeker), Carol A., and Robert E. Shadwick. The mechanical properties of the toad in vivo and in vitro. *Journal of Biomechanics*, 20:891, 1989.

## REFERENCES

### **Dr. Tina Gabriele**

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(Teaching supervisor at U of C)  
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### **Dr. Reed Ferber**

Associate Professor of Anatomy  
(Teaching Partner)  
Faculty of Kinesiology, University of Calgary  
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### **Stephen Bonfield**

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**Dr. Rita Dirks**, Program Chair, English  
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