

# CURRICULUM VITAE (Short Form, Updated April 2014)

Carlo J. De Luca, Ph. D.

## Education:

1972 Ph.D. Queen's University, Canada  
1968 M.Sc. University of New Brunswick, Canada (Biomedical Engineering)  
1966 BA Sc. University of British Columbia, Canada (Electrical Engineering)

## Academic Appointments:

2011-Present Professor of Physical Therapy, Boston University, Sargent College of Health and Rehabilitative Sciences  
2007-Present Professor of Electrical and Computer Engineering, Boston University, College of Engineering  
1985-Present Research Professor of Neurology, Boston University, School of Medicine  
1984-Present Professor of Biomedical Engineering, Boston University  
1999-2001 Adjunct Professor, University of Medicine and Dentistry at New Jersey, School of Osteopathic Medicine  
1985-1995 Senior Lecturer in Mechanical Engineering, MIT  
1979-1984 Principal Research Associate in Orthopædic Surgery, Harvard Medical School  
1978-1984 Research Member, Harvard-MIT Division of Health Science and Technology  
1977-1984 Adjunct Associate Professor in Biomedical Engineering, Boston University  
1973-1985 Lecturer in Mechanical Engineering, MIT  
1973-1979 Research Associate in Orthopædic Surgery, Harvard Medical School  
1972-1973 Assistant Professor in Anatomy, Queen's University  
1971-1972 Lecturer in Anatomy, Queen's University  
1970-1971 Lab Instructor in Anatomy, Queen's University  
1969-1970 Lecturer in Biomedical Engineering, Queen's University  
1968-1969 Lecturer in Computing Science, University of New Brunswick

## Other Professional Appointments:

1997-Present Founder and CEO of Altec Inc  
1993-Present Founder and CEO of Delsys Inc  
1984-Present Founder and Director, NeuroMuscular Research Center, Boston University  
1988-1992 President, International Society of Electrophysiological Kinesiology  
1984-2000 Health Science Specialist, Department of Veterans Affairs  
1980-1984 Founder and Director, NeuroMuscular Research Lab., Dept. Orthopædic Surgery, Children's Hospital, Boston, MA  
1978-1984 Research Member, Harvard-M.I.T. Division of Health Science and Technology  
1973-1984 Research Associate in Orthopædic Surgery, Children's Hospital, Boston, MA  
1973-1995 Project Director, Liberty Mutual Research Center, Hopkinton, MA

## Awards and Honors:

2012 The Borelli Award, American Society of Biomechanics  
2006 The Tibbetts Award from the Small Business Technology Council, USA  
2005 Founding fellow of Biomedical Engineering Society  
2002 Presidential Keynote Speaker, Gait and Clinical Movement Analysis Society  
2000 The John Basmajian Lecture, Int'l Soc of Electrophysiological Kinesiology  
1999 Isabelle and Leonard H Goldenson Technology Award, United Cerebral Palsy Foundation  
1998 The John Basmajian Lecture, Int'l Soc of Electrophysiological Kinesiology  
1994 Stuart Reiner Memorial Lecture American Association of Electrodiagnostic Medicine  
1993 Wartenweiler Memorial Lecture, International Society of Biomechanics  
1993 Founding Fellow of the American Institute of Medical and Biological Engineering (AIMBE)  
1989 Int'l Volvo Award on Low Back Pain Res, Int'l Soc for the Study of the Lumbar Spine  
1986 Fellow of the Institute of Electrical and Electronics Engineers

- Who's Who among Italian Americans (2001)

- Who's Who in Science and Engineering (1995, 1996)
- Who's Who in Medicine and Healthcare (1995, 1997, 1998)
- Who's Who in American Education (1991-Present)
- Men of Achievement (also 1990/1994)
- Who's Who in America (1988-Present)
- Who's Who in Emerging Leaders in America (1987, 1989, 1990)
- Who's Who in Rehabilitation (1985)
- Who's Who in the World (1985, 1994 – Present)
- Who's Who in Frontier Science and Technology (1984, 1986)
- Personalities of America (1983)
- Who's Who in the East (1981-Present)

**Research Interests:**

- 1) Motor control of normal and abnormal muscles
- 2) Objective assessment of movement in neurologically impaired individuals
- 3) Innovative technology for monitoring and analyzing surface EMG signals
- 4) Automatic and accurate decomposition of the surface EMG signal

**Major Assignments (selected):**

- 1995-Present Scientific Advisory Board, Henry H. Kessler Foundation and Kessler Institute for Rehabilitation
- 2002-2006 National Advisory Council for National Institute for Biomedical Imaging and Bioengineering of NIH
- 1988-2000 Scientific Review and Evaluation Board, Department of Veterans Affairs
- 1991-1992 Scientific Review Panel, Ontario Ministry of Health, Canada
- 1988-1992 Administration Committee of the Engineering in Medicine and Biology Society
- 1977-1980 Review Committee on Rehab. Engineering Research and Development, Department of Veterans Affairs
- 1985-present Reviewer for various European Government Agencies for research projects

**Editorial Boards:**

- 1994-1995 *Spine*
- 1990-2000 *Journal of Occupational Rehabilitation*
- 1990-1992 Co-Founder & Editor-in-Chief, *Journal of Electromyography and Kinesiology*
- 1987-1991 *Electroencephalography & Clinical Neurophysiology*
- 1985-1991 *Orthopædics*
- 1981-1990 *Journal of Motor Behavior*
- 1978-2000 *Journal of Rehabilitation Research*

**Publication Summary:**

Books	1
Book Chapters	20
Articles in Refereed Journals	112
Abstracts	262
Keynote Speeches	17
Reviews	5
Monographs	2
Invited Presentations	138
Miscellaneous	4

**Citations:** over 13,000

**Patents:** 12

**Books:**

Basmajian, J.V. and De Luca, C.J. Muscles Alive, (5th Edition): Williams and Wilkins, Baltimore, MD 1985.

**Monographs:**

De Luca, C.J. and Knaflitz, M. *Surface Electromyography, What's New?*, CLUT Publishers, Torino, Italy, 1992.

De Luca, C.J. *Precision Decomposition, "Methods in Clinical Neurophysiology"*, Dantec Inc., 1993.

### **Reviews (selected):**

De Luca, C.J. Physiology and mathematics of myoelectric signals. *IEEE Transaction on Biomedical Engineering*, 26: 313-325, 1979.

De Luca, C.J. Myoelectric manifestations of localized muscular fatigue. *CRC Critical Reviews in Biomedical Engineering*, 11: 251-279, 1984.

### **Articles (selected):**

De Luca, C.J. Physiology and Mathematics of myoelectric signals, *IEEE Trans. on Biomed. Engineering*, 26: 313-325, 1979

De Luca, C.J., LeFever, R.S., McCue, M.P. and Xenakis, A.P. Control scheme governing concurrently active human motor units during voluntary contractions. *Journal of Physiology*, 329: 129-142, 1982.

De Luca, C.J. Myoelectric manifestations of localized muscle fatigue, *CRC Critical Reviews in Biomedical Engineering*, 11: 251-279, 1984.

De Luca, C.J. and Merletti, R. Surface myoelectric crosstalk among muscles of the leg. *Electroencephalography and Clinical Neurophysiology*, 69: 568-575, 1988.

De Luca, C.J. Use of the surface EMG signal for performance evaluation of back muscles. *Muscle and Nerve*, 16: 210-216, 1993.

Collins, J.J. and De Luca, C.J. Open-loop and closed-loop control of posture: a random-walk analysis of center-of-pressure trajectories. *Experimental Brain Research*, 95: 308-318, 1993.

De Luca, C.J. and Erim, Z. Common drive of motor units in regulation of muscle force. *Trends in Neuroscience*, 17(7): 299-305, 1994.

Erim, Z., De Luca, C.J., Mineo, K., and Aoki, T. Rank-ordered regulation of motor units. *Muscle and Nerve*, 19: 563-573, 1996.

De Luca, C.J., Foley, P.J., and Erim, Z. Motor unit control properties in voluntary isometric isotonic contractions. *Journal of Neurophysiology*, 76(3): 1503-16, 1996.

De Luca, C.J. The use of surface electromyography in biomechanics. *J. of Applied Biomechanics*, 13: 135-163, 1997.

Erim, Z., Beg, M.F., Burke, D.T., and De Luca, C.J. Effects of aging on motor unit control properties. *Journal of Neurophysiology*, 82: 2081-2091, 1999.

Oddsson, L., De Luca, C.J., Activation imbalances in lumbar spine muscles in the presence of chronic low back pain. *Journal of Applied Physiology* 94: 1410-1420, 2003.

Adam, A., De Luca C. J., Firing rates of motor units in human vastus lateralis muscle during fatiguing isometric contractions. *Journal of Applied Physiology*, 99: 268-280, 2005.

De Luca C.J., Adam A, Wotiz R, Gilmore LD, and Nawab SH. Decomposition of surface EMG signals. *Journal of Neurophysiology*, 96: 1646-1657, 2006.

Nawab SH, Wotiz RP, and De Luca C.J. Decomposition of indwelling EMG signals. *Journal of Applied Physiology*, 105: 700-710, 2008.

De Luca C.J., Gonzalez-Cueto JA, and Adam A. Motor unit recruitment and proprioceptive feedback decrease the common drive. *Journal of Neurophysiology*, 101:1620-1628, 2009.

Contessa P, Adam A, and De Luca C.J. Motor unit control and force fluctuation during fatigue. *Journal of Applied Physiology*, 107: 235-243, 2009.

Roy SH, Cheng MS, Chang SS, Moore J, De Luca G, Nawab SH, and De Luca C.J. A combined sEMG and accelerometer system for monitoring functional activity in stroke. *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 17 (6): 585-594, 2009.

De Luca C.J., Gilmore LD, Kuznetsov M, and Roy SH. Filtering the Surface EMG signal: Movement artifact and baseline noise contamination. *Journal of Biomechanics*, 43 (8): 1573- 1579, 2010.

Nawab SH, Chang SS, and De Luca C.J. High-yield decomposition of surface EMG signals. *Clinical Neurophysiology* – in press May 2010, DOI # 10.1016/j.clinph.2009.11.092.

### **Thesis Supervised:**

1. **Stulen FB.** M Sc, MIT, 1975.
2. **Lichtenberg BK.** M Sc, MIT, 1975.
3. **LeFever RS.** Ph D, MIT, 1980.
4. **Stulen FB.** Ph D, MIT, 1980.

5. **Oslan AL.** M Sc, Boston University, 1981.
6. **Xenakis AP.** Ph D, Boston University, 1981.
7. **Lawrence JH.** M Sc, MIT, 1981.
8. **Mambrito B.** Ph D, MIT, 1983.
9. **Balin M.** MD, Harvard, 1984.
10. **Creigh J.** M Sc, MIT, 1984.
11. **Gomez G.** M Sc, Boston University, 1988.
12. **Casavant DA.** M Sc, Boston University, 1987.
13. **Scala G.** M Sc, Boston University, 1988.
14. **Xia N.** M Sc, Boston University, 1989.
15. **Paul N.** M Sc, Boston University, 1990.
16. **Brody L.** M Sc, Boston University, 1991.
17. **Erim Z.** Ph D, Boston University, 1991.
18. **Buijs RJC.** Elektrotechnisch Ingenieur, Delft University of Technology, Netherlands, 1993.
19. **Foley P.** M Sc, Boston University, 1994.
20. **Kupa E, Jr.** M Sc, Boston University, 1994.
21. **Giphart JE.** Elektrotechnisch Ingenieur, Delft University of Technology, Netherlands, 1994.
22. **Imhoff T.** Diplom-Ingenieur der Elektrotechni, Rheinisch-Westfälische Technische Hochschule Aachen, Helmholtz Institute, Aachen, Germany, 1994.
23. **Batra H.** M Sc, Boston University, 1995.
24. **Adam, Alexander.** M Sc, Boston University, 1995.
25. **Beg, Faisal.** M Sc, Boston University, 1997.
26. **Lelas, Jennifer.** M Sc, Boston University, 1999.
27. **Giphart, Johan E.** Ph D, Boston University, 2001.
28. **Velisar, Anca.** M Sc, Boston University, 2001.
29. **Adam, Alexander.** Ph D, Boston University, 2002.
30. **Meyer, Peter.** Ph D, Boston University, 2002.
31. **Sherill, Delsey.** M Sc, Boston University, 2003.
32. **McGowan, Matthew.** M Sc, Boston University, 2007.
33. **Lyford, Nicholas.** M Sc, Boston University, 2008.
34. **Soto, Jeff Boutros.** M Sc, Boston University, 2009.
35. **Hostage, Emily Clare.** M Sc, Boston University, 2009.
36. **Contessa, Paola.** Ph D, University of Padua, 2010.
37. **Kuznetsov, Mikhail** M Sc, Boston University, 2010.
38. **Ganesan, Santosh** M Sc, Boston University, 2010.
39. **Zaheer, Farah** Ph D, Boston University, 2011.
40. **Cole, Bryan T.** Ph D, Boston University, 2013.
41. **Kline, Joshua C.** Ph D, Boston University, 2013.
42. **Puleo, Alessio** MS, Politecnico di Torino, 2014.

**Research Associates who Trained with Professor De Luca:**

1. **Sabbahi M.** 1979-84
2. **Merletti R.** 1980 (Oct - Dec) and 1985 (Sept) - 1986 (Jan)
3. **Broman H.** 1982-83
4. **Roy S.** 1982-present
5. **Tiegerman V.** 1984-85
6. **Schneider J.** 1984-85
7. **Felici F.** 1985 (June-Aug)
8. **Matsuzawa I.** 1985-86
9. **Stashuk D.** 1985-88
10. **Noda Y.** 1986-87
11. **Damen G.** 1986-87
12. **Knafnitz M.** 1987, 1990
13. **Catani F.** 1988-1989

14. **Masuda T.** 1988-89
15. **Balestra G.** 1989 (April-Aug)
16. **Rossi B.** 1989 (June-July)
17. **Masakado Y.** 1989 (July) - 1990 (June)
18. **Collins J.** 1990 (Sept) - 1997 (Dec)
19. **Kiryu T.** 1990 (June) -1991 (March)
20. **Daplan C.** 1991 (Sept)
21. **Mineo K.** 1991(March) -1992 (April)
22. **Nagata A.** 1991 (Sept) - 1992 (March)
23. **Aoki T.** 1992 (Feb) - 1994 (Feb)
24. **Erim Z.** 1992 (May) - 2001 (Dec)
25. **Buchman A.** 1992 (Aug) - 1993 (July-Aug)
26. **Westgaard R.** 1995 (Aug) - 1996 (July)
27. **Bonato P.** 1996 (March) - 2002 (Sept)
28. **Bullock-Saxton J.** 1996 (Nov) - 1997 (April)
29. **Tassinary L.** 1997 (Jan) - 1998 (Dec)
30. **Kothiyal K.** 1998 (July) - 1998 (Dec)
31. **Kollmitzer J.** 1998 (Sept) -1999 (Aug)
32. **Salvini T.** 1998 (Sept) - 1999 (Aug)
33. **Manto M.** 1999(Jan) - 2000 (Jan)
34. **Ebenbichler G.** 1999 (Jan) - 2000 (Aug)
35. **Kaneko F.** 2000 (Mar) - 2000 (Oct)
36. **Gonzalez-Cueto J.** 2001 (Jan) - 2001 (Dec)
37. **Miwa M.** 2002 (Sep) – 2003 (Mar)
38. **Lee J.** 2003 (Jan) – 2004 (Jan)
39. **Riberio E.** 2005 (Jan) – 2005 (June)
40. **Zemkova E.** 2005 (Oct) – 2006 (April)
41. **Contessa, P.** 2008 (Mar) – 2009 (Dec)