

RÉSUMÉ

NAME: Don B. Chaffin

DATE: January, 2010

WIFE'S NAME: Barbara Ann

CITIZENSHIP: U.S.A.

CHILDREN: Paul Brian
LeAnne Denise
Jeffrey William

DATE OF BIRTH: 4/17/39 Sandusky, Ohio

PRESENT ACADEMIC RANK: R.G. Snyder Distinguished University Professor (Emeritus)
University of Michigan
College of Engineering

DEPARTMENTS: Industrial and Operations Engineering,
Biomedical Engineering,
and Environmental Health Sciences in School of Public Health

DATES OF APPOINTMENT TO ACADEMIC RANKS AND MAJOR DUTIES AT THE UNIVERSITY OF MICHIGAN:

Assistant Professor, 1968-1969

Associate Professor, 1970-1972

Professor, Industrial & Operations Engineering, 1973

Professor, Occupational Health in School of Public Health, 1982-2006

Chairman, Industrial and Operations Engineering, 1977-81

Director, Center for Ergonomics, 1980-81 & 1984-1998

Director, Center for Occupational Health and Safety Engineering, 1982-1986, 1987-1990

Member, College of Engineering Executive Committee, 1982-1986

G. Lawton and Louise G. Johnson Professor of Industrial and Operations Engineering and Biomedical Engineering, 1993-2006

Professor, Biomedical Engineering, 1996-2006

Director, Human Motion Simulation Laboratory, 1998-2005

Richard G. Snyder Distinguished University Professor, 2004-present (Emeritus 2007)

DEGREES, WITH FIELD, INSTITUTION, AND DATE:

B.S. (Industrial Engineering), General Motors Institute, 1962

M.S. (Industrial Engineering), University of Toledo, 1964

Ph.D. (Industrial Engineering), The University of Michigan, 1967

ACADEMIC TEACHING ACTIVITIES - COURSES TAUGHT:

IOE 400 - Engineering Management

IOE 333 and 433 Introduction to Ergonomics

IOE/BME 534- Occupational Biomechanics

IOE/BME 635- Biomechanics and Physiology of Work Lab

IOE 836 - Seminar in Ergonomics

IOE 837/EIH 662- Seminar in Occupational Health and Safety Engineering

SPECIFIC CONTRIBUTIONS TO CLASSROOM OR LABORATORY INSTRUCTION AT BOTH GRADUATE AND UNDERGRADUATE LEVEL

Introduced (taught and wrote formal lecture notes) Biomechanics for Physical Medicine, at The University of Kansas Medical Center, 1967-68.

Introduction of biomechanics into ergonomics courses (IOE 433 and 533) at The University of Michigan.

Developed and taught new engineering course at The University of Michigan, IOE 534/ BME 534 (Occupational Biomechanics), 1970-2005 (average 24 students/term).

Director of traineeship program, now Center for Occupational Health and Safety Engineering, 1972-1986, 1987-1990.

Developed new laboratory course at The University of Michigan, IOE 635 (Laboratory in Physiology and Biomechanics of Work), 1975-1985 (average 14 students).

Directed the expansion of research laboratory for the study of human performance, health, and safety problems related to occupational stresses.

Developed and taught IOE 333: Introduction to Ergonomics, 1970-1982 (70-90 students) 1992, 1994, 1999 (120-150 students).

Organized IOE 836: Ergonomics Seminars, 1973-present (10-15 students).

Co-organized IOE 837/EIH 662, Occupational Health and Safety Engineering Seminar, 1973-2005, with faculty in School of Public Health (15-25 students).

OTHER TEACHING EXPERIENCE:

Assistant Professor of Physical Medicine, University of Kansas Medical Center, 1967 to 1968. Responsibilities were (a) to perform research into the techniques and uses of biomechanics and electromyography as applied to industrial tasks to be performed by both healthy and physically limited individuals; (b) to consult with the Corporate Biomechanics Research Group at Western Electric Company, Kansas City, Missouri; (c) to teach courses in biomechanics for physical therapy; (d) to work with Kansas City Art Institute, Industrial Design Department, in developing lectures and research pertinent to the design of physical aids for the handicapped.

Assistant Professor of Industrial and Operations Engineering, The University of Michigan, 1968-69. Associate Professor 1970-73. Professor 1973-present. Responsibilities are (a) to perform research to determine the effects of the physical work environment (i.e., workplace layout, tool design, work methods) on local muscle fatigue and musculoskeletal injury; (b) to develop and teach concepts relating to psychological, physiological, and anatomical limitations of human-hardware system performance; (c) to develop methods of applying human performance concepts to design of contemporary human-hardware system; (d) to assist in designing a human performance curriculum which integrates the common interest of both the engineer, industrial hygienist, physician in the betterment of human performance capabilities; (e) Direct Traineeship Program, Center for Occupational Health and Safety Engineering under sponsorship of NIOSH; (f) serve as Chairman of Industrial and Operations Engineering, 1977-1981; (g) organize and serve as Director of Center for Ergonomics 1980-81 and 1984-1998; organize and serve as Director, Human Motion Simulation Laboratory 1998-2006.

Continuing Education Developed and cochaired (with T. Armstrong) annual two, one-week (now 4-day) Occupational Ergonomics courses for practicing engineers and occupational health and safety professionals (average 100 attendees annually during 90's). Also provided major lectures annually to over 600 engineers and occupational health and safety professionals in various meetings (see Presentations).

INDUSTRIAL EXPERIENCE:

Junior Draftsman, Mack Iron & Steel Company, Sandusky, Ohio, Summer 1956-1957.
Responsibilities: To design and field check miscellaneous iron and steel structures.

Engineering Student-in-training, New Departure Division, General Motors Corporation, Sandusky, Ohio, 1957-1961. (part-time).

Inspection Foreman, New Departure Division, General Motors Corporation, Sandusky, Ohio, 1962.
Responsibilities: To supervise a group of twenty highly skilled personnel in the inspection of precision ball bearings for aircraft guidance systems.

Quality Control Engineer, New Departure Division, General Motors Corporation, Sandusky, Ohio, 1963. Responsibilities: To analyze and design new precision gages for subminiature ball bearings.

Project Engineer, Micrometrical Division, Bendix Corporation, Ann Arbor, Michigan, 1964.
Responsibilities: To analyze and design existing and proposed measuring systems to determine the relative errors contributed by the machine and the operator.

MAJOR CONSULTING WORK:

Western Electric Company, 1967-1976.

National Institute for Occupational Safety and Health (Grants Review - NIH Health Study Section, August 1972-1976).

National Advisory Committee for Occupational Safety and Health, NACOSH, appointed member by Secretary, U.S. Department of Labor, 1977-1981.

Consulted with the following organizations on control of physical work stress: 3M Corporation, GMC, Motor Vehicle Manufacturing Association, ALCOA, United Airlines, Kaiser Aluminum, Michigan Consolidated Gas, General Tire, Chrysler, UAW, Goodyear, Firestone, Jewel Foodstores, Owens Corning Fiberglas, Marathon Oil, Gulf Oil, Ford Motor Company, Exxon, Walt Disney World, Johnson Controls and US Postal Service.

National Institute for Occupational Safety and Health to write *Guide to Manual Lifting*, 1977-1980, and *Evaluation of Lifting Techniques*, 1983.

Consulted with OSHA to develop better *Safety Standard on Walking and Working Surfaces*, 1978-1982.

Consulted with NATO to set up and Cochair *Symposium on Anthropometry and Biomechanics* held at Cambridge University, Great Britain, in July 1980.

Consultant to Director of OSHA, to evaluate Directorate of Safety Standards Performance and Organization, 1976.

Board of Scientific Counselors for NIOSH, 1988-1991, appointed by Secretary of U.S. Dept. of Health and Human Services.

National Research Council "Soldier Systems Panel) Member 2003-2006, Chair 2007-2009
Army Research Board, Life Science Advisory Committee 2006

National Academy of Engineering, Vice-Chair of Industrial, Manufacturing and Operations Engineering Section, 2008-2010.

SCIENTIFIC AND PROFESSIONAL SOCIETIES OF WHICH A MEMBER:

American Academy for Advancement of Science (Fellow)

American Industrial Hygiene Association (Fellow)
American Institute of Medical and Biological Engineering (Fellow)
American Society of Biomechanics (Founding Member and past president 1987)
Association of Univ. Programs in Occupational Health and Safety past President (1980-1990)
Ergonomics Society of Great Britain (Fellow and Lifetime Honorary Fellow)
Human Factors and Ergonomics Society (Fellow)
Institute of Industrial Engineers
International Society of Biomechanics
National Academy of Engineering (1994)
Society of Registered Engineers (Professional Engineer - Ohio)
Sigma Xi Honorary Research Society
SAE International 2006 (Fellow)

PROFESSIONAL AND SCIENTIFIC SOCIETY DUTIES:

Editor of Ergonomic Guides and Monographs, American Industrial Hygiene Association (1974-1977).
Editorial Advisor, *Journal of Occupational Health and Safety*, (1995-2000).
Editorial Advisor, *Journal of Biomechanics* (1983-1992).
President, Association of University Programs in Occupational Health and Safety (1982/83).
Council Member, International Society of Biomechanics (1985-1991).
Secretary General, International Society of Biomechanics (1989-91).
President, American Society of Biomechanics (1988).
Director, Industrial Ergonomics Technical Group, Human Factors Society (1990-91).
Director, Industrial Ergonomics Division, Amer. Indust. Hygiene Assoc. (1990-91).
Associate Editor: *Human Factors Journal* (1994-2000).
Technical Advisory Board Member: Johnson Automotive Systems (1995-2001).
Health Advisory Board Member: UAW-GM Joint National Committee (1995-2002)
Advisory Board Member, IE Department, University of Wisconsin (1996-2006).
Advisory Board Member, ISE Department, Ketterin University, (2004-present)
SAE – Organizer Digital Human Modeling Conference, 1998 Conference Chair (1995-present)
SAE Transaction peer reviewer (1995-2007)
Member of Editorial Board for IE Handbook, 2001.
National Academy of Engineering Peer Committee, for selection of candidates for membership in the Industrial and Manufacturing Section, for 2001-2004.
National Academy of Engineering, Officer Nominating Committee 2005-2006.
National Academy of Engineering—Vice-chair 08-10 and Chair 10-11 of Industrial, Manufacturing and Operations Engineering Section.
National Academia of Sciences—NRC Advisory Panel for Soldier Systems Directorate, Army Research Laboratory (member 2004-2007 and Chair, 2007-2009).
National Academia of Sciences—Reviewer of NRC report on NIOSH Personal Protection Technology Program 2008.
Organizer and Co-Director of National Academy of Engineering Regional Meeting and National Symposium on: “Engineering to Improve the Operations of Manufacturing Enterprises” 2010.
Co-Director of NSF Workshop: “Reshaping U.S. Manufacturing for Global Competitiveness”, May, 2010.
Member, NRC Board on Human Systems Integration, 2010-present, and Director of project to plan study of “Human Systems Integration in Engineering Education Programs”.

HONORS AND AWARDS:

Sigma Xi, The University of Michigan, Honorary Research Society (elected member 1970)

Arch T. Colwell Award, Outstanding safety research, from Society of Automotive Engineers (1972).

Kramer Award, American Academy of Occupational Medicine, outstanding paper written in the field of occupational health (1974).

Outstanding Engineering Alumnus Award, University of Toledo (1983).

Atwood Outstanding Engineering Service Award, The University of Michigan (1984).

Wartenweiler Memorial Lecturer, International Society of Biomechanics (1985).

Fellow - The Ergonomics Society (1985)

Fellow - Human Factors and Ergonomics Society (1986)

Paul M. Fitts Outstanding Educator Award, Human Factors Society (1990).

David Baker Outstanding Research Award, Institute of Industrial Engineers (1991).

Outstanding Faculty Research Award, Ind. & Opers. Eng., Univ. of Mich. (1992).

G. Lawton and Louise G. Johnson Endowed Professor, Ind. & Opers. Eng, Univ. of Mich. (1993-2006).

Edward Baier Technical Achievement Award, American Industrial Hygiene Association (1994).

Fellow - American Institute for Medical and Biological Engineering (1994).

Elected to Membership in National Academy of Engineering (1994).

75th Year Diamond Jubilee Alumnus Award, General Motors Institute (1995).

Honorary Lifetime Fellow-- Ergonomics Society of Great Britain (1995).

Fellow-- American Industrial Hygiene Association (1995).

Giovanni Borelli Outstanding Scientist Award, American Society of Biomechanics (1999).

Award from SAE for serving as General Program Chair of the Digital Human Conference (2000).

Award for outstanding service to UAW-GM workers by the National Joint Committee for Health and Safety at GM (2001).

Fellow-- American Association for the Advancement of Science (2003).

Doctor Honoris Causa in Engineering, Kettering University (2003).

Institute of Industrial Engineering, Soc. for Work Science, MM Ayoub Award (2004).

Fellow—Society of Automotive Engineers (2005).

UM-IOE Outstanding Accomplishment Award (2006).

SAE, Arch T. Colwell Merit Award (2006) shared with Matt Reed and David Wagner.

President's Award for lifetime achievement, Human Factors and Ergonomic Society (2007).

National Engineering Award, American Association of Engineering Societies (2008).

COMMITTEES AND COUNSELING ASSIGNMENTS IN DEPARTMENT, COLLEGE, AND THE UNIVERSITY:

Ad Hoc Committee for Review of Bioengineering, 1969.

Industrial Engineering Curriculum Committee, 1969-1971, 1976-1977, 1985.

Bioengineering Ph.D. Qualifying Committee, 1971-1972.

IOE Financial Aid Committee, 1972-1974, 1986.

Chairman of IOE Financial Aid Committee, 1973-1974.

IOE Executive Committee, 1973-1974, 1976-1977, 1986-1988, 1989-1990, 1991-93, 2001-02.

IOE Undergraduate Program Administrative and Counseling Committee, 1973-1974.

IOE Undergraduate Advisor, 1976-1977.

Member of Program Committee for Computers Information and Control Engineering program, 1977-1981.

Member, College of Engineering Standing Committee, 1977-1981.

Member, Program Committee of Institute for Public Policy Systems, 1977-1980.

Member of College Committee for Review of Affirmative Action for Handicapped Students, 1978.

Member, Search Committee for Director of Institute for Public Policy Systems Program, 1979.

Member, Review of Office of Vice President for Research, 1984.

Participated in U/M Promotional Activities. Resulting in interviews for *Technology Review*, *Business Week*, WXYZ-TV, *Wards Auto World*, *ABC World News*, *WJR*, and about a dozen newspapers and radio stations around the country each year in late 1980s.

Chairman, Review Committee for Ph.D. Program in Urban Technology and Environmental Planning (1986).
Member and Chair, Faculty Search and Promotion Committees in Engineering and School of Public Health 1993-2004.
University Distinguished Faculty Awards Selection Committee (1995).
Engineering Summer Conference Course (co-chair), 1980 to present.
UROP Undergraduate Research Program (advisor), 1994 -2000 (3 students per year).
Biomedical Engineering Biomechanics Curriculum Committee (Chair) 1996.
Biomedical Engineering Executive Committee (member) 1996-2000.
Rackham Faculty Research Awards Committee, 1998-1999.
Office VP for Research Advisory Committee 2000-2001.
Biomedical Engineering Curriculum Committee Chair 2000-2004.
College of Engineering – Technology Transfer Committee 2000-2001.
College of Engineering – Co-chair Faculty Development Campaign (2002-2006).
College of Engineering – Strategic Planning Committee (2002-2003).
College of Engineering—Emeritus Faculty Committee (2008-present).
College of Engineering—NAE Symposium (Chair Organizing Committee and Director) 2009-2010.

LEAVES OF ABSENCE AND SABBATICAL LEAVES WHILE AT MICHIGAN:

Sabbatical leave, Fall Term, 1974 - Visiting Professor, University of Florida.
Sabbatical leave, Winter Term, 1982 - Visiting Professor, University of California - Irvine.
Sabbatical leave, Winter Term 1991, Visit various laboratories in the United States and Australia.
Sabbatical leave, Winter Term 1998, Visit companies and Government Labs using Human Simulation Methods in United States and Europe.

MAJOR SPONSORED RESEARCH ACTIVITIES:

Continued research on the adverse health effects of manual materials handling activities in industry. Combined support of over \$100,000/year from Firestone, Marathon Foundation, Gulf Foundation, Alcoa Foundation, Jewel Industries, Kaiser Aluminum, Owens Corning Fiberglas, AMP, EXXON, and GenCorp has been acquired, with other companies interested. Several published papers and support for eight Ph.D. students has resulted from 1977 to 1995.

Occupational Health and Safety Engineering Traineeship Program, National Institute for Occupational Safety and Health, *Center Training Grant* -\$372,500, July 1972 - July 1976. Renewed for five years for \$515,000 until 1981, renewed 1980 for five years for \$3,900,000 (shared with SPH and the School of Nursing) until 1985, converted to Center Grant 1982, approved 1985-1990 (Annual funding of approximately \$580,000 for four years. Additional Ph.D. research training grant for four years added about \$200,000/year in 1990. Renewed as Center Grant for five more years at about \$700,000/year through 2000. Twenty-one faculty and over 117 graduate students are involved in the Center.

Assisted Gary Herrin in developing an *Ergonomics Project for Chrysler* which was approved and funded - \$225,000/year for 3 years total (1987-1990). Supports four Ph.D. students.

Headed group developing nine-year Ergonomics Research and Continuing Education Program for Ford Motor Company, *Ergonomics of Vehicle Assembly Plant Operations*. Approximately \$530,000/year 1982-1988 (with Gary Langolf, Thomas Armstrong, Monroe Keyserling, others in Center for Ergonomics). A second four-year program approved 1989-1993. Eight Ph.D. students have been supported by this program.

Co-director of NIH Grant with G. Andersson (Rush Institute) on *Biomechanics of Asymmetric Low-Back Loading*, \$100,000/year 1988-1991, renewed for three years, \$60,000/year (1992-1995).

Co-director of Walt Disney World study of physical overexertion injuries (1990-1993). Supported one Ph.D. student and one post-doctoral scholar (\$150,000/year).

Director of Coca-Cola study of package handling (1992-1993). Supported one Ph.D. student (\$100,000/year).

Co-principal Investigator on NIA sponsored study of strengths in older people (1993-1994), with Lois Verbrugge and Charles Woolley (\$40,000/year). One Ph.D. student supported.

Principal Investigator of Chrysler project to model and predict arm and head motions of vehicle drivers (\$200,000/year) 3 yrs (1995-1998). Two Ph.D. students supported.

Principal Investigator and Director of Ford project (\$150,000/year) to develop ergonomic design guidelines for Materials Handling Devices (1995-1998). Two Ph.D. students supported.

Formed and director of Consortium composed of GM, Ford, DaimlerChrysler, International Truck, Lockheed Martin, US Postal Service, US Army and others to support human motion simulation in HUMOSIM laboratory (with Julian Faraway, Statistics; Bernard Martin, IOE; Matt Reed, UMTRI) \$400,000/year (1998-present). Six Ph.D. students supported each year.

3DSSPP software royalties (shared with C. Woolley) \$35,000/year

Co-investigator in National Inst. For Disability Rehabilitation and Research Center grant (T. Armstrong, Center Director), provides support for B. Martin, D. Chaffin to study reach motions of people with spinal cord injuries and chronic low back pain with B. Martin. (Part of T. Armstrong's RERC) 1999-2003, \$121,000/yr.

Thrust Area Director 2000-2006 in UM Automotive Research Center: on Human Centered Design Simulation (with Brent Gillespie in ME and Matt Reed in UMTRI) (2000 to 2009) \$300,000/year.

Workshop on Manufacturing—NSF (co-chair with Jack Hu) \$40,000.

CURRENT DOCTORAL COMMITTEE ACTIVITY:

David Wagner	Ph.D. (IOE)	Candidate	(Co-chair)
Suzanne Hoffman	Ph.D. (IOE)	Candidate	(Co-chair)

DOCTORAL COMMITTEES (CHAired OR CO-CHAired ARE LISTED):

1969	LaVerne Hoag	- Research Scientist, Bell Laboratories (Past Professor, Oklahoma U.)
1970	Kerry Kilpatrick	- Professor, Indust. Eng. University of Florida
1971	Michael Stern	- Private Consultant
1971	Marlan Thomas	- Professor and Dean of Engineering, Air Force Institute, Dayton, OH
1972	Fred Schanne	- Vice President of Operations, Ajilon Consulting, Detroit, Michigan
1973	Arun Garg	- Professor and Chair, Industrial Eng. Univ. of Wisconsin-Milwaukee
1973	Shashikant Kelkar	- Professor, Production Eng., University of Bombay
1973	Kyung Park	- Professor, Industrial Engineering, Univ. of Korea, Seoul
1973	Brian Quigley	- Professor (retired), Sports Science, University Melbourne
1974	Rodney Schutz	- Research Scientist, Bell Laboratory, now Professor Georgia State University
1976	Thomas Armstrong	- Professor, Industrial & Operations Eng, University of Michigan, and Director, Center for Ergonomics
1979	Andy Freivalds	- Professor, Industrial Engineering, Penn State University
1979	W. Monroe Keyserling	- Professor, IOE, University of Michigan
1979	Myun Lee	- Professor and past Chair, Ind. Eng., Seoul Nat'l University
1981	Steven Goldstein	- Professor, Orthopaedic Surgery, and past Vice Provost Medical Research and Graduate Studies, University of Michigan
1982	Kwan Lee	- Professor and Past Chair, Industrial Engineering, Seoul University
1982	Terry Stobbe	- Professor, Indust. Eng., W. Virginia University.
1983	Charles Anderson	- President, Advanced Ergonomics, Inc., Dallas, Texas

1985	Susan Evans	- President, Susan Evans & Associates, Arlington, VA
1986	Steven Wiker	- Professor, Industrial Engineering, Univ of West Virginia
1986	Rob Radwin	- Professor, and Chair, Biomedical Engineering, University of Wisconsin, Madison
1987	Don Bloswick	- Professor, Industrial and Mechanical Engineering, University of Utah
1988	Mark Redfern	- Chaired Professor, Biomedical Engineering, University of Pittsburgh
1989	Jeffrey Woldstad	- Professor, Industrial Engineering, Texas Tech Univ
1991	Richard Hughes	- Associate Professor of Surgery, University of Michigan
1992	Douglas Beck	- Senior Useability Engineer, Hewlett-Packard, Colorado Springs, CO
1992	Carter Kerk	- Professor, South Dakota School of Mines & Technology
1993	Deborah Thompson	- Research Engineer, BAE Systems, Minneapolis, MN.
1993	Marc Resnick	- Professor, Florida International University, Miami, FL
1994	Maury Nussbaum	- Professor, Virginia Tech, Blacksburg, VA
1994	Ulrich Raschke	- Advanced Technology Manager, Siemens Corp., Ann Arbor, MI
1997	Xudong Zhang	- Associate Professor, Orthopedics and Biomedical Eng, University of Pittsburgh
1998	Trina Buhr	- Research Engineer, Medtronic, St. Paul, MN
1998	Matt Reed	- Associate Research Professor, UMTRI and Center for Ergonomics, Ann Arbor, MI
2003	Woojin Park-	- Associate Professor, Auburn University
2004	Matt Parkinson	- Assistant Professor, Department of Engineering Design, Penn State University.
2004	Clark Dickerson	- Assistant Professor, Department of Kinesiology, University of Waterloo
2006	Kevin Rider	- Assistant Professor, Industrial and Systems Engineering, University of West Virginia
2007	David Wagner	-Research Engineer, Ozen Engineering, Sunnyvale, CA.
2008	Suzanne Hoffman	-Research Engineer, Post-Doctoral Student, UMTRI, Ann Arbor, MI

SUMMARY OF PUBLICATIONS

One Hundred Thirty peer reviewed papers in Ergonomics, Industrial Engineering and Occupational Health and Safety Journals (see major publications below).

Six Books – Authored, Co-authored:

Workers and their Tools, Pendell Press, 1976;

Anthropometry and Biomechanics, Theory and Application, Plenum Press, 1981; *Occupational Low Back Pain*, Mosby, 1985 and 1991 (2nd Ed.),

Occupational Biomechanics, John Wiley, June 1984, 1991, 1999, 2006 (4th Ed.); (D. Chaffin, G.B.J. Andersson, B.J. Martin)

Digital Human Modeling for Vehicle and Workplace Design: Society of Automotive Engineers, 2001. (D.B. Chaffin)

Working Postures and Movements, CRC Press, Nico Delleman, Christine Haslegrave, Don Chaffin, 2005.

Thirty-five Chapters in Books.

Seventy-two Papers, Monographs, and Written Proceedings (not all listed).

MAJOR PUBLICATIONS: (1966-2007)

1966

The Prediction of Physical Fatigue During Manual Labor. *The Journal of Methods Time Management*, 11(5):25-32, 1966. (D.B. Chaffin)

1967

The Development of a Prediction Model for the Metabolic Energy Expended during Arm Activities. Ph.D. Dissertation, 1967. (D. B. Chaffin)

An Historical Analysis of the of the Prediction of Physical Fatigue in Industrial Operations. *The Journal of Methods Time Management*, 12(2):22-261, 1967. (D.B. Chaffin)

1969

Electromyography – A Method of Measuring Local Muscle Fatigue. *The Journal of Methods Time Management*, 14(2):1969. (D.B. Chaffin)

Physical Fatigue: What it is–How it is Predicted. *The Journal of Methods Time Management*, 14(3):20-28, 1969. (D.B. Chaffin)

An Empirical Investigation of Low Back Strains and Vertebrae Geometry. *Journal of Biomechanics*, 2:89-96, 1969. (D.B. Chaffin and E.J. Moulis)

Surface Electromyography Frequency Analysis as a Diagnostic Tool. *JOM*, 11(3):109-115, 1969. (D.B. Chaffin)

A Computerized Biomechanical Model – Development of and Use in Studying Gross Body Actions. *Journal of Biomechanics*, 2:429-441, 1969. (D.B. Chaffin)

1970

A Biomechanical Model for Analysis of Symmetric Sagittal Plane Lifting. *AIIE Transactions*, 2(1):16-27, 1970. (D.B. Chaffin and W.H. Baker)

A Computer-Assisted Manual Work-Design Model. *AIIE Transactions*, 2(4):348-354, 1970. (D.B. Chaffin, K.E. Kilpatrick, and W.M. Hancock)

The Effects of Skin Resistance and Capacitance Coupling on EMG Amplitude and Power Spectra. *Electromyography*, Sep-Oct 10(3):273-286. (F.J. Schanne and D.B. Chaffin)

1971

Prediction of Physiological Strain of Workers on the Production Floor. *Int. J. Prod. Res.*, 9(4):457-471, 1971. (L.L. Hoag, W.M. Hancock and D.B. Chaffin)

The Effect of Prior Muscle Exertions on Simple Movements. *Human Factors*, 13(4):355-361, 1971. (B.M. Lance and D.B. Chaffin)

A Computerized Biomechanical Model Applied to Analysis of Skiing. *Medicine and Science in Sports*, 3(2):89-96, 1971. (B.M. Quigley and D.B. Chaffin)

1972

Biomechanical Computerized Simulation of Human Strength in Sagittal-Plane Activities. *AIIE Transactions*, 4(1):19-28, 1972. (J.B. Martin and D.B. Chaffin)

1973

A Longitudinal Study of Low-Back Pain as Associated with Occupational Weight-Lifting Factors. Given at AIHC in Boston, and published in *American Industrial Hygiene Journal*, December 34(12):513-525, 1973. (Don B. Chaffin and Kyung S. Park)

Localized Muscle Fatigue - Definition and Measurement. *JOM*, 15(4):346-354, 1973. (D.B. Chaffin)

Cervical Range of Motion and Dynamic Response and Strength of Cervical Muscle. Reprinted November 1973 and 1974, *SAE Transactions*, 4(82), SAE Paper No. 730975, (D.R. Foust, D.B. Chaffin, R.G. Snyder, and J.K. Baum)

1974

Performance of a Combined Manual and Decision Task with Discrete Uncertainty. *International Journal of Production Research*, 12(3):409-425, 1974. (M. Thomas and W. Hancock and D.B. Chaffin)

A Biomechanical Evaluation of Two Methods of Manual Load Lifting. *AIIE Transactions*. 6(2)105-113, June 1974. (K. Park and D.Chaffin)

Human Strength Capability and Low-Back Pain. *JOM*, 16(4):248-254, 1974. (D.B. Chaffin)

1975

Biomechanics of Manual Materials Handling and Low-Back Pain. In *Occupational Medicine: Principles and Practical Applications*, edited by Carl Zenz, Year Book Medical Publishers, Inc., Chicago, IL, 1975. (D.B. Chaffin)

The Problem of Manual Materials Handling. *Industrial Engineer*, July 1975, p. 24-29. (D.B. Chaffin and M.M. Ayoub)

Ergonomics Guide for the Assessment of Human Static Strength. *American Industrial Hygiene Association Journal*, 36(7):505-511, 1975. (D.B. Chaffin)

Manual Material Handling - An Ergonomic Problem for Industrial Engineers. *Industrial Engineering*, 7, July 1975. (D.B. Chaffin)

A Biomechanical Computerized Simulation of Human Strength. *AIIE Transactions*, 7(1):1-15, 1975. (Arun Garg and Don B. Chaffin)

Prediction of Load Lifting Limits for Manual Materials Handling. *Professional Safety*, 20(5):44-48, 1975. (K.S. Park and D.B. Chaffin)

Subclinical Psychomotor and Neuromuscular Changes in Workers Exposed to Inorganic Mercury. *AIHA Journal*, October 36(10):725-733, 1975. (with J. Miller, D. Chaffin and R Smith)

1976

A Practical Heat Stress Prediction Methodology. *AIIE Transactions*, 8, 1976. (W. Hancock and D. Chaffin)

An Investigation of Fitts' Law Over a Wide Range of Movement Amplitudes. *Journal of Motor Behavior*, 8(2), June 1976. (G. Langolf, D. Chaffin and J. Foulke)

Workers and their Tools. Pendell Publishing Company, Midland, MI, December 1976, co-authored with L. Greenberg

1977

A Method for Evaluating the Biomechanical Stresses Resulting from Manual Materials Handling Jobs. *AIHA Journal*, Dec 38(12):662-675, 1977. (D. Chaffin, G. Herrin, W. Keyserling, and A. Garg)

1978

Preemployment Strength Testing--An Updated Position. *JOM*, 20(6):403-408, 1978. (D. Chaffin, G. Herrin, and W. Keyserling)

An Investigation of the Relationship Between Displacements of the Finger and Wrist Joints and the Extrinsic Finger Flexor Tendons. *Journal of Biomechanics*, 11(3):119-128, 1978. (T. Armstrong and D. Chaffin)

Prediction of Metabolic Rates for Manual Materials Handling Jobs. *AIHA Journal*, August 39(8):661-674 1978. (A. Garg, D. B. Chaffin and G. Herrin)

Surface Electromyography in Chronic Inorganic Mercury Intoxication, in *Adverse Effects of Environmental Chemicals and Psychotropic Drugs: Quantitative Interpretation of Function Tests*, (Ed.) M. Horvath, E. Frantik Elsevier, Amsterdam, 1978. (B.D. Dinman and D.B. Chaffin)

Evaluation of Workers Exposed to Elemental Mercury Using Quantitative Tests of Tremor and Neuromuscular Functions. *American Industrial Hygiene Association Journal* 39(12):976-984, December 1978. (G.D. Langolf, D.B. Chaffin, R. Henderson and H.P. Whittle)

1979

Manual Materials Handling: the Cause of Over-exertion Injury and Illness in Industry. *Journal of Environmental Pathology and Toxicology* Special Issue, Proceedings of the NIOSH First Annual Scientific Symposium, 2(5):31-66, 1979. (D. Chaffin)

Carpal Tunnel Syndrome and Selected Personal Attributes. *JOM* 21(7):481-486, July 1979. (T. J. Armstrong and D. B. Chaffin)

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Parkinson, M.B., D.B. Chaffin, and M.P. Reed (2006). "Center of pressure excursion capability in performance of seated lateral reaching tasks", *Clinical Biomechanics*, 21, p26-32.

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Dickerson, C.R., D.B. Chaffin, and Hughes R., (2007). "A mathematical musculoskeletal shoulder model for proactive ergonomic analysis". *Computer Methods in Biomechanics and Biomedical Engineering* 10:6;389-400.

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N. J. Seo, T.J. Armstrong, D.B. Chaffin and J. Ashton-Miller, "Inward Torque and High-Friction Handles can reduce required muscle effort for torque generation", *Human Factors*, 50 (1) 37-48.

N. J. Seo, T.J. Armstrong, D.B. Chaffin and J. Ashton-Miller, "The Effect of Handle Friction and Inward or Outward Torque on Maximum Axial Push Force" *Human Factors*, 50, (2) 227-236.

D. B. Chaffin, "Some requirements and fundamental issues in digital human modeling", Chapter in **Handbook of Digital Human Modeling**, V. Duffy (ed.), Taylor Francis Publications, New York, NY,

2009

D.B. Chaffin, "The evolving role of biomechanics in prevention of overexertion injuries" *Ergonomics*, 52(1), p3-14.

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D.W. Wagner, M.P. Reed, and D. B. Chaffin, (2010), "The development of a model to predict the effects of worker and task factors on foot placements in manual materials handling tasks" *Ergonomics*, 53 (11), pp. 1368-1384.

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S. G. Hoffman, M.P. Reed and D.B. Chaffin, (2011), "A study of the difference between nominal and actual hand forces in two-handed sagittal plane whole-body exertions", *Ergonomics*, 54 (1), p47-59.

RECENT PROCEEDINGS, PRESENTATIONS, PANELS, ETC.

A New Method for Measuring and Modeling functional Reach, Proceedings **SAE DHM Conference**, Washington, DC, June 2001. (M. Reed, M. Parkinson, D. Chaffin)

Analysis and simulation of upper body motion of people affected by low back pain or spinal cord injury. Presented at the **RESNA 2001 Annual Conference and Educational Program**, June 22-26, 2001, Reno, NV, 2001. (N. Womack, K. Kim, B. Martin, A. Haig, and D. Chaffin)

Chaffin, D.B., Woolley, C., Martin, B., Womack, N., and Dickerson, C. Reaching and object movement capability in the spinal cord injured population, Proceedings **NIDRR Workshop on Anthropometrics**, Buffalo, NY, May, editor: A. D. Steinfeld, 2001.

Exertion-driven Strength Modeling of the Shoulder. Presented at **SAE Digital Human Modeling Conference**, Arlington, VA, June 26-28, 2001. (C.R. Dickerson and D.B. Chaffin)

Invited Keynote Address: Simulating human reach motions for ergonomics analyses, at **Computer Aided Ergonomics and Safety Conference**, July 2001. (D. Chaffin)

Invited Panelist for Auto Manufacturing Suppliers Monthly Breakfast Meeting with CEO's of four companies to discuss safety in the workplace, March 2001. (D. Chaffin)

Invited Plenary Address to the **Automotive Research Center Conference** in Dearborn MI., May 2001. (D. Chaffin)

Invited Talk, **Amer, Inst, of Medicine and Biological Engineering Conference**, Washington, DC, March 2001. (D. Chaffin)

Modeling of effort perception in lifting and reaching tasks. Presented at **SAE Digital Human Modeling Conference**, Arlington, VA, June 26-28, 2001. (K. Kim, B.J. Martin, D.B. Chaffin, and C.B. Woolley)

Modifying motions for avoiding obstacles. Presented at **SAE Digital Human Modeling Conference**, Arlington, VA, June 26-28, 2001. (W. Park, D.B. Chaffin, and B.J. Martin)

Reaching and object movement capability in the spinal cord injured population. Presented at **NIDRR Workshop on Anthropometrics**, Buffalo, NY, May 2001. (D.B. Chaffin, C. Woolley, B. Martin, N. Womack, and C. Dickerson)

Simulation of Simultaneous Muscle Strength and Balance Constraints During One and Two Handed Lifting, **HFES 2001**, October 8-12, Minneapolis, MN, 2001. (D.B. Chaffin, and C.B. Woolley)

The Effect of Motion Dynamics in Calculation of External Joint Moments During Light Industrial Hand Motions. Presentation at **American Society of Biomechanics**, San Diego, CA, August, 2001. 2001. (C.R. Dickerson, D.B. Chaffin, K. Kim, B.J. Martin, and N. Womack)

Biomechanical Modeling of Shoulder Loading and Perceived Effort during Task Performance. Presented at **8th Annual Automotive Research Center Conference**, Ann Arbor, Michigan, May 15, 2002. (C. Dickerson, D. Chaffin)

Low back biomechanics and manual materials handling, for **Italian Occupational Medicine Association Conference on Prevention of Musculoskeletal Disorders in the Workplace**, Invited Paper, October 2002. (Chaffin, D.B.)

Development of a Head-Hand Coordination Model. Submitted to **SAE Digital Human Modeling Conference**, Munich, Germany. 2002. (K. Kim and B.J. Martin)

Biomechanical differences in shoulder loading in populations during load-bearing tasks, **Proceedings of the IV World Congress of Biomechanics**, Calgary, AB, Canada, August 5, 2002. (Dickerson C.R., Kim K.H., and Adamo D., Martin B.J. and Chaffin D.B.)

An analysis of shoulder loading differences for simulated industrial task performance between injured and non-injured subject populations, **46th Annual Meeting of the Human Factors and Ergonomics Society**, Baltimore, MD, 2002. (Dickerson, C.R., and Chaffin, D.B.)

Biomechanical Modeling of Shoulder Loading and Perceived Effort during Task Performance, **5th Annual Automotive Research Center Conference (ARC)**, Ann Arbor, MI, 2002. (Dickerson, C.R., and Chaffin, D.B.)

Digital Human Modeling in Vehicle Design, **Automotive Research Conference**, Detroit, MI, May, 2002. (D. Chaffin)

Invited Plenary Talk: Methods for Predicting Motions used in Ergonomic Analyses. Invited paper, **2002 SAE Digital Human Modeling Conference**, Munich, Germany. June, 2002. (D. Chaffin)

Biomechanical Differences in Shoulder Loading in Populations During Load-Bearing Tasks Presented at **IV World Congress of Biomechanics**, Calgary, Alberta, Canada, August 5, 2002. (C. Dickerson, K. Kyunghan, D. Adamo, B. Martin, D. Chaffin)

Low Back Biomechanics and Manual Materials Handling, Invited paper, **Italian Occupational Medicine Association Conference on Prevention of Musculoskeletal Disorders in the Workplace**, October, 2002. (D. Chaffin)

Maintaining Balance in Seated Reaches **2002 RESNA Conference**, Minneapolis, Minnesota, 2002. (M. Parkinson, D. Chaffin, M. Reed)

Memory-based Human Motion Simulation. **SAE Digital Human Modeling Conference**, Munich, Germany. 2002. (W. Park, D.B. Chaffin, and B.J. Martin)

Modeling of Shoulder and Torso Effort Perception in Manual Tasks. **SAE Digital Human Modeling Conference**, Munich, Germany. 2002. (K. Kim, B.J. Martin, C.R. Dickerson and D.B. Chaffin)

A motion modification algorithm for memory-based human motion simulation, Proceedings of the **HFES 46th Annual Conference**, 1172-1175, Baltimore, 2002. (Park, W., Martin, B., and Chaffin, D.)

Simulating Human Motions for Ergonomics Analyses, Invited paper, **Japanese National Institute of Advanced Industrial Science and Technology (AIST)**, Workshop on Bioengineering Applications, March, 2002. (D. Chaffin)

A New Approach to Modeling Driver Reach. Accepted for presentation **2003 SAE World Congress** (M.P. Reed, M.B. Parkinson and D.B. Chaffin)

Simulating Complex Multi-Phased Manual Handling Motions Via Motion Modification, **SAE Digital Human Modeling Conference**, 2003-01-2227, Montréal, Canada: Society of Automotive Engineers, June 2003. (Chaffin, D., Park, W., Rider, K., and Martin, B.)

Improving digital human modeling for proactive ergonomics in design, Ergonomics in the Digital Age, XVth Triennial Congress of the **International Ergonomics Association and The 7th Joint Conference of Ergonomics Society of Korea/Japan Ergonomics Society, August 24-29, Seoul, Korea, 2003**. (Chaffin, D.B.)

An Analysis of the Relationship Between Biomechanical Loading And Perceived Effort at the Shoulder for Weighted Reach Tasks, **2003 Midwest Graduate Student Biomechanics Symposium**, Toledo, OH, 2003. (Dickerson, C.R., and Chaffin, D.B.)

Dynamic Loading and Effort Perception During One-Handed Loaded Reaches, Proceedings of the **American Society of Biomechanics 27th Annual Meeting**, Toledo, OH, 2003. (Dickerson, C.R., and Chaffin, D.B.)

Evaluating Loading and Perceived Effort at the Shoulder: A Quantitative Biomechanical Approach to Task Analysis, **6th Annual Automotive Research Center Conference**, Ann Arbor, MI, 2003. (Dickerson, C.R., and Chaffin, D.B.)

Optimizing Workstation Layouts Utilizing Motion Modification Algorithms Accepted for presentation *SAE Digital Human Modeling Conference, Montreal, Canada, 2003* (K.A. Rider, W. Park, D.B. Chaffin, and B.J. Martin)

Performance Comparison of Soft and Hard Button Displays Under Vertical Vibration. Accepted for presentation *2003 SAE World Congress* (K.A. Rider, K.J. Mikol, D.B. Chaffin, M.P. Reed, K.J. Nebel)

Pilot Study of the Effects of Vertical Ride Motion on Reach Kinematics, *SAE World Congress, 2003-01-0589*, Detroit, Michigan: Society of Automotive Engineers, March 2003 (Rider, K., Mikol, K, Chaffin, D., Reed, M., Nebel, K.).

Redesigning Workstation Utilizing Motion Modification Algorithm, *SAE Digital Human Modeling Conference, 2003-01-2195*, Montréal, Canada: Society of Automotive Engineers, June 2003. (Rider, K., Park, W., Chaffin, D., Reed, M.)

B Martin. K. Kim, A. Haig, C Hadgis, S Choe D Chaffin. Analysis and simulation of upper body motion of people affected by low back pain or spinal cord injury. IEA. Seoul Korea. 2003

Human Motion Simulation for Vehicle and Workplace Design. Presented at the *International Conference—“Human Aspects of Advanced Manufacturing”* Galway, Ireland, August, 2004. (Chaffin, D.B.)

Evaluating the Effect of Back Injury on Shoulder Loading and Effort Perception in Hand Transfer Tasks, *SAE International Digital Human Modeling for Design and Engineering Symposium* (DHM) June 15-17, Rochester, MI, 2004. *SAE 2004 Transactions, Aerospace* 2004-01-2137. (Dickerson, C.R., Kim, K.H., Martin, B.J., and Chaffin, D.B.)

Balance for People with Thoracic Spinal Cord Injury, *SAE International Digital Human Modeling for Design and Engineering Symposium* (DHM) June 15-17, Rochester, MI, 2004. *SAE 2004 Transactions, Aerospace* 2004-01-2138. (Parkinson, M., Chaffin, D.B., Reed, M.P.)

Analysis and Redesign of Battery Handling Using JACK and HUMOSIM Motions, *SAE International Digital Human Modeling for Design and Engineering Symposium* (DHM) June 15-17, Rochester, MI, 2004. *SAE 2004 Transactions, Aerospace* 2004-01-2145. (Rider, K.A., Chaffin, D.B., Foulke, J.A, and Nebel, K.J.)

Modeling In-Vehicle Reaches Perturbed by Ride Motion, *SAE International Digital Human Modeling for Design and Engineering Symposium* (DHM) June 15-17, Rochester, MI, 2004. *SAE 2004 Transactions, Aerospace* 2004-01-2180. (Rider, K.A., Chaffin, D.B., Nebel, K.J., and Mikol, K.J.)

Transitioning from Reactive to Proactive Ergonomics, Presented *National Ergonomics Conference* December 1-3, 2004, Las Vegas, Nevada. (Chaffin, D.B.)

Predicting Foot positions for Manual Materials Handling Tasks. *Digital Human Modeling for Design and Engineering Symposium, 2005*. (Wagner, D.W., Reed, M.P., Chaffin D.B.)

A Biomechanical Basis for Low Back Injury Risk in High Exertion Tasks. Invited Keynote Address at *Annual Human Factors and Ergonomics Conference, Orlando, FL, 2005*. (Chaffin, D.B.)

Effects of Hand Force on Posture and Motion. Presented at the *Annual Conference of the Automotive Research Center* June, 2005. (S.G. Hoffman, Chaffin, D.B., and Reed, M.P.)

Upper Body Coordination in Asynchronous, Visually-Guided Manual Tasks. Presented at the *Annual Conference of the Automotive Research Center*, June, 2005. (Danker, J.S., Reed, M.P., and Chaffin, D.B.)

Critical Features in Human Motion Simulation for Ergonomic Analysis. *Annual Human Factors and Ergonomics Conference*, Orlando, FL., 2005. (Reed, M.P., Faraway, J., and Chaffin, D.B.)

Rider, K., D.B. Chaffin, and B.J. Martin. Development of Active Human Response Model to Ride Motion. Proceedings of *SAE Digital Human Modeling for Design and Engineering Conference*, Lyon, France, 2006.

Reed, M.P., J. Faraway, D.B. Chaffin, and B.J. Martin. The HUMOSIM Ergonomics Framework: A New Approach to digital Human Simulation for Ergonomic Analysis. Proceedings of *SAE Digital Human Modeling for Design and Engineering Conference*, Lyon, France, 2006.

Chaffin, D. B. “Biomechanical Considerations in Human Motion Modeling” **ISyE Colloquim**, University of Wisconsin, December 2006.

Chaffin, D. B. “The Case for Musculoskeletal Systems Biomechanics: With an emphasis on restoring and sustaining human function”, **National Summit on Biomechanics**, Keystone, Colorado, June, 2007.

Chaffin, D. B. “The Role of Motion Modeling in Digital Human Modeling for Proactive Ergonomics in Design” **Association of Canadian Ergonomists National Conference**, Toronto, ONT, October, 2007.

Chaffin, D. B. “The Human Research and Engineering Directorate”, Chapter in: 2008 Assessment of the Army Research Laboratory, **NAS report**, National Academy Press, Washington, D.C. June, 2008

Chaffin, D. B. “Digital Human Simulation for Analysis and Design of Workspaces”, invited talk, ISE Department, **Georgia Institute of Technology**, October, 2009.

Chaffin, D. B. “Improving the Quality of Human Life through Enhanced Human Systems Integration”, invited talk: **North Carolina State University Workshop** on: Meeting the NAE Grand Challenges, December, 2009.

Chaffin, D. B. Introductory comments at **National Symposium on: Engineering to Improve the Operations of Manufacturing Enterprises**, Univ. of Michigan and National Academy of Engineering, May 13, 2010.

Chaffin, D. B. “Biomechanical considerations in support of NIOSH Lifting Guidelines” Panel presentation on **Occupational Safety: The Past, Present and Future**, at **HFES Conference**, October, 2010, San Francisco, CA.