Dr. Richard Collins, Ph.D., M.Sc., B.Sc.

Biomechanics and Biomedical Engineering Consultant

440 Monmouth Drive, Cranberry Township, PA 16066-5756
(Pittsburgh, Pennsylvania area)

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Technical Support in Litigation

Profile

Demonstrated accuracy in research and scientific analysis in mechanical and biomedical engineering and regulatory assessments. Former university professor of Biomedical & Human Factors Engineering; Former Professor of Medicine; and Former Professor of Mechanical and Aerospace Engineering.

Areas of Specialization

- Qualified as an expert witness in civil and criminal courts.
- Internationally recognized engineering and medical expertise.
- Wrongful death, medical and dental malpractice; medical device/product liability
- Injury biomechanics in automotive crashes, aircraft crashes, elevator failures, sports impacts and slips and falls.
- Head Injury & spine cases due to motorcycle, bicycle collisions, along with protective helmet liability issues.
- Accident reconstruction and failure analysis for litigation involving serious personal injury and trauma
- Analyses involving motor vehicle accidents, automotive, train and aircraft accident and injury analysis and traffic safety, forklift turnovers, elevator free-falls, slips, trips and falls; sports injuries, product liability in industrial, sports, recreational & safety equipment; sports and industrial injuries, ergonomics & repetitive stress syndromes.
- Biomedical device malfunctions: insulin pumps, failures of implanted supports/prostheses for fractured limbs
- Radiation dose exposure during medical diagnostic CT scans; medical malpractice and product liability.
- Extensively published in the peer-reviewed national and international literature.
- Numerous invited scientific lectures presented in 38 countries
- Invited Scientific Reviewer for many national and international journals

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Expert Services

Expertise includes analyses of vehicular, industrial, recreational, commercial, and sports-related injuries in addition to the evaluation of protective devices and safety systems, such as seat belts and helmets. Services may include:

- Summary & analysis of accident reports, witness statements, depositions, damage reports, scene photographs, etc.
- Inspection and analysis of vehicles; machinery; objects associated with an injury and the injury environment; and identification of injury causation and injury prevention factors and tolerance threshold criteria.
- Protective devices evaluation (seat belts, air bags, clothing, guards, helmets) to identify injury causation factors.
- Evaluation of workplace hazards and equipment, to assess and evaluate injury causation factors.
- Computer analyses including animation and simulation in both demonstrative and analytic formats.
- Search and retrieval of relevant literature from medical and engineering databases.
- Re-enactment of human kinematics or injury scenarios on-site or in laboratory setting
- Preparation for deposition, arbitration, mediation, or trial.
- Preparation of court exhibits (photographs, charts, graphs, anatomic models, animation, and literature summaries).

Academic Credentials

Ph.D.	Mechanical Engineering/Aeronautical Sciences University of California, Berkeley, California
M.Sc.	Aeronautical and Aerospace Engineering University of Toronto, Institute of Aerospace Studies, Toronto, Canada
B.Sc.	Engineering Physics University of Toronto, Toronto, Canada

Invited Scientific Reviewer:

Journal: Heat and Mass Transfer – published by Springer Berlin / Heidelberg (Germany)
NSF (National Science Foundation) SBIR/STTR grant proposal reviewer, Panel Participant
Journal of Biomechanical Engineering (U.S.A.)
Journal of Biomechanics
Applied Mechanics Reviews (U.S.A.)
Canadian Heart Foundation Applications
Mathematical and Computer Modeling - An International Journal
International Journal of Pharmaceutics
Cooperative Grants Program of the U.S. Civilian Research and Development Foundation
for the Independent States of the Former Soviet Union
National Medical Research Council (NMRC) Singapore
Heat Transfer Engineering Journal – an International Journal (published by Taylor and Francis)

Board Memberships:

- He served as co-director of Department of Transportation programs for the study of motor vehicle trauma, which was a joint activity of the UCLA School of Engineering and School of Medicine. In this role, he organized multi-disciplinary research efforts involving a large group of faculty from both Engineering and Medical Schools.

- Member, Editorial Board: Applied Microgravity Technology
- Associate Editor: Annales Françaises de Chronométrie et Microtechnique
- Scientific Committee: International Union of Theoretical and Applied Mechanics (IUTAM)
- Executive Board Program Committee: SAFE Wright Brothers Chapter
- Society of Automotive Engineers (SAE)

Awards & Honors

Cited in:

- International Who's Who of Contemporary Achievement – 1984
- Who's Who in the World, Sixth Edition - 1982-1983
- Men of Achievement, Ninth Edition - 1982
- Who's Who in the World, Fifth Edition - 1980-1981
- Who's Who in Western Europe - 1978-1979
- NATO-AGARD Scientific Consultant (Europe) - 1972-1973
- American Men of Science - 1969

Professional Experience (Mechanical, Aerospace and Biomedical Engineering)

2004 – 2009:	Professor of Mechanical Engineering and Graduate Faculty Advisor, Department of Mechanical Engineering, University of Nevada, Las Vegas
2002 – Present:	Biomechanics International. – Pittsburgh, Pennsylvania Senior Forensic Consultant, Biomechanics and Biomedical Engineering
2001 – 2002:	Senior Associate in Injury Causation Analysis and Litigation Support, Forensic Biomechanics
2000 – 2001:	Research Professor of Physics and Mathematics - Wright State University, Dayton, Ohio
1995 – 1998:	Research Professor of Biomedical and Human Factors Engineering - Wright State University, College of Engineering and Computer Science, Dayton, Ohio
1996 – 1997:	Senior Consultant, US Air Force Armstrong Laboratory (Human Systems Division), Wright-Patterson Air Force Base, Dayton, Ohio
1994 – 1995:	Principal Scientist, US Air Force Armstrong Laboratory - Wright-Patterson AFB, Dayton, OH
1989 – 1994:	President, Biodynamics International - Halifax, Canada
1985 – 1989:	A. D. Foulis Professor of Biomedical Engineering and Professor of Mechanical Engineering University of Nova Scotia, Halifax, Canada
1985:	Senior Scientist, Stanford Research International - Menlo Park, California
1983 – 1985:	Senior Physicist, Physics International Company - San Leandro, California
1980 – 1982:	Professor of Medicine, University of Besançon – France
1979 – 1982:	Professor of Physics, Chemistry and Automation, University of Toulouse III – France

1975 – 1978:	Professor of Biological and Medical Engineering, University of Compiègne - France Director of Graduate Programs in Biomedical Engineering, University of Compiègne – France
1976 – 1977:	Consultant, Société Nationale des Poudres et Explosifs – France
1972 – 1975:	Associate Professor of Theoretical and Applied Mechanics, University of Paris VI &VII, Paris, France and Researcher at INSERM (National Institute of Medical Research)
1972 – 1974:	Senior Research Engineer, Géonuclear El Paso - Geneva, Switzerland
1966 – 1975:	Assistant Professor of Applied Mechanics & Structures - University of California Co-director of graduate programs, with certain research projects under DOT sponsorship
1969 – 1972:	Senior Researcher, Rand Corporation - Santa Monica, California
1967 – 1970:	Consultant, Geophysical Technology Corp., Pasadena, California

Areas of Specialization

1. Blast waves and Explosions - **Published research studies in fluid mechanics and gas dynamics**

- Shock Physics: Development and implementation of experimental programs for generating cylindrical explosions by strong electrical discharge into stoichiometric mixtures of hydrogen and oxygen. High speed rotating drum and multi-spark Schlieren photography. Analysis of results within a framework of wave propagation theory.

- Nuclear Explosions at the Ocean Surface: Theoretical analysis of shock wave propagation with special attention to the air-water interface.

- Shock Wave Propagation of arbitrary strength into regions of non-uniform density separated by a free surface - Analytical and numerical techniques based on the method of characteristics.

- Breakup of liquid droplets released into high-speed gas flows (2 to 5 km/sec) - analysis subsequently corroborated by experiments.

- Fluid-Shell Interactions: Theoretical analysis of the dynamic response of a submerged structure to underwater explosions - numerical computations of diffracted shock wave patterns and structural loading.

2. Biomedical phenomena:

Bioengineering/Biomechanics

- physiological fluid dynamics, cardiovascular and pulmonary hemodynamics, uptake of volatile toxicant vapors by the respiratory tract and the skin, blood flow transport to the brain and eyes;
- Biomedical instrumentation, mathematical modeling and numerical computer-based predictions of physiological response to a wide variety of underlying complex physiological mechanisms;
- Physiologically based pharmacokinetic modeling and rheology of biological tissues;
- Flow dynamics in collapsible vessels, lubrication of articular joints, macromolecular transport in the arterial wall, fluid dynamics of the eye, and cardiac mechanics; and

- Particle deposition in the pulmonary airways, subcutaneous circulation, cardiovascular response to G-stress in both microgravity (space environment) and hypergravity (aviation physiology).
- design of controlled-release drug delivery using implantable polymeric drug-impregnated monoliths programmed to release drug in therapeutic dose-time protocols by polymeric erosion or global timed biodegradation

Published Research Studies in Biomechanics:

♦ Biomechanics of joint lubrication: modification of cartilage permeability and consequently, deformation and fluid transport, across the articular surfaces; determination of rheological properties of synovial fluid; development of new mathematical models for computing the criteria for formation and maintenance of a monomolecular inter-articular mucin film.

♦ Pulmonary circulation: developed first analytical model to demonstrate that variations in flow and pressure transmission as a function of frequency depend critically upon the capacity of the pulmonary vessels to collapse and re-open, and much less upon radial expansion of already patent vessels.

♦ Fluid flow in collapsible tubes: theoretical study of the fluid-wall interaction and mechanism of vessel opening and closing; application to controlled collapse of the veins, and to nonstationary flow phenomena occurring in coronary and pulmonary blood vessels.

♦ Cardiac mechanics: theoretical and clinical evaluation of myocardial contractility on the basis of left ventricular regional ejection dynamics using wall markers and cinéangiography.

♦ Respiratory mechanics: development of an original computational model for periodic flow in the airways of the complete human lung and evaluation of regional particle deposition using radioisotopes as tracers.

♦ Autoregulation of the cerebral circulation: formulation of a model for the complete branching network of the circulation of the human brain, direct laboratory measurements of the detailed anatomy of the cerebral venous network from precision polymer casts; computation of the unsteady pressure and flow fields as a function of boundary conditions at the carotid arteries and jugular veins; assessment of the quantitative role of local CO_2 and O_2 distributions on non-invasively measured flow profiles.

♦ Passive and active control of the coronary circulation: mathematical model for blood flow in the complete coronary circulation subjected to high gravitational loading.

♦ Development of an artificial cartilage: embedded fixed electrical charges in a cross-linked polymer matrix to simulate the natural osmotic swelling pressure.

♦ Cardiovascular response to G-stress in microgravity (space) and hypergravity (aerial combat) with autonomic nervous system involvement.

♦ Biodynamics of the eye: characterization of the material properties of the ocular tissues (corneo-scleral envelope, aqueous humor) and the role of relaxation coefficients in the autoregulation of intraocular pressure with consequences for glaucoma.

- Uptake of volatile vapors by inhalation: construction of a mathematical model for the estimation of the uptake by the pulmonary airflow of volatile (toxic) vapors in the lower respiratory tract. Account taken of the lipophilicity of the chemicals and their concentrations at the alveolar level. Solutions computed for a variety of breathing and cardiac cycles. Of particular interest are short-term exposures to acutely toxic vapors.

- Dermal absorption of volatile vapors: computational model for the solution of the diffusion equation for a highly anisotropic lipid bilayer medium. Particular account taken of the variation in path length and permeability coefficients in the estimation of the penetration of toxic chemicals into and out of the skin, with eventual uptake of the chemical by the venous circulation draining from the skin into the systemic circulation.

- Controlled release drug delivery from implanted ceramic and polymeric capsules:
  Mathematical modeling and computer simulations can be very effective in improving and optimizing the performance of the self-regulating release of therapeutic drugs into specific regions of the body. Development of a reliable computational design tool for predicting the resulting pharmacokinetic dose distributions as a function of time and space. Of primary importance in such models are the time-varying effective permeability of the capsule to the various molecules composing the drug, the effective solubility and diffusion coefficients of the drug and its metabolites in the surrounding tissues and fluids and the uptake of the drug at the target organ.

- Forensic Biomechanics: analysis of trauma-related failures of: **a)** soft tissues: ligament, tendon, muscle, cervical and thoracolumbar spine, and articulations such as the knee, hip and shoulder joints, chondrolysis; **b)** hard tissues: skull fractures, closed head injuries; **c)** medical device failure analysis; and skin and flesh burns, **d)** amputations

Current and Past Affiliations

- American Society of Mechanical Engineers (ASME) - U.S.A.
- Biomedical Engineering Society (BMES) - U.S.A.
- Biological Engineering Society - U.K.
- Société de Biomécanique - France
- American Society of Engineering Education (ASEE) - U.S.A.
- American Association for the Advancement of Science (AAAS) - U.S.A.
- Association for the Advancement of Modeling & Simulation Techniques in Enterprises - France
- American Institute of Aeronautics and Astronautics (AIAA) - U.S.A.
- Canadian Medical and Biological Engineering Society (CMBES) - Canada
- European Society of Biomechanics - Netherlands
- Canadian Aeronautics and Space Institute (CASI) - Canada
- Canadian Society of Aviation Medicine (CSAM) - Canada
- Canadian Applied Mathematics Society - Canada
- Aerospace Medical Association/Life Sciences & Biomedical Engineering Branch (LSBEB) – U.S.A.
- The Society of Automobile Engineers (SAE)

Honors – Cited in:

- International Who's Who of Contemporary Achievement – 1984
- Who's Who in the World, Sixth Edition - 1982-1983
- Men of Achievement, Ninth Edition - 1982
- Who's Who in the World, Fifth Edition - 1980-1981
- Who's Who in Western Europe - 1978-1979
- NATO-AGARD Scientific Consultant (Europe) - 1972-1973
- American Men of Science - 1969

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International Scientific Journal Publications and Reports

1960 – 2009: Dr. Collins has had published 120 international scientific journal publications and reports. (Detailed publication and reports listing shall be provided upon request.)

Contributions to Conferences, Seminars and Symposia

1967 – 2010: Dr. Collins has contributed to 200 presentations in the following 38 countries. (Detailed presentation listing shall be provided upon request.)

Armenia	China	Holland	Poland	Thailand
Austria	Czech Republic	Hong Kong	Russia	Trinidad
Australia	Denmark	India	Scotland	Turkey
Azerbaijan	England	Israel	Singapore	Ukraine
Belgium	France	Italy	South Africa	United States
Bulgaria	Georgia	Japan	Spain	Venezuela
Brunei	Germany	Malaysia	Sweden	
Canada	Greece	Norway	Switzerland	

Nationality and Citizenship

- Birthplace: Toronto, Canada
- Citizenship - United States of America

Availability

Available nationwide and internationally for presentations, consultations and qualified expert witness case assignments.

Notice

A fully detailed Curriculum Vitae containing publications and presentations can be viewed at our website:

https://sites.google.com/site/riccollins/home and
http://sites.google.com/site/riccollins/litigationsupport-personalinjurycases

Languages

English, French, German, Russian. Extensive international experience in science, engineering and medicine.