Gas Bubble Dynamics in the Human Body

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Gas Bubble Dynamics in the Human Body

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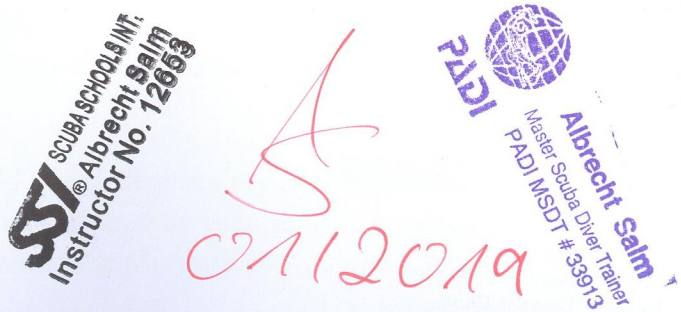

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Gas Bubble Dynamics in the Human Body equips researchers working within hyperbaric medicine with modern physical and mathematical methods to optimize their findings and ultimately deliver new therapies. These methods point to a deeper understanding, more accurate predictions, and improved treatment modalities by injecting modern applied math (particularly differential equations) and physical chemistry (particularly diffusion kinetics and thermodynamics) into the field. By bringing these disciplines to bear on the problems in the field, the work aims to add significantly to its applied, theoretical, and interpretive components.

Key Features

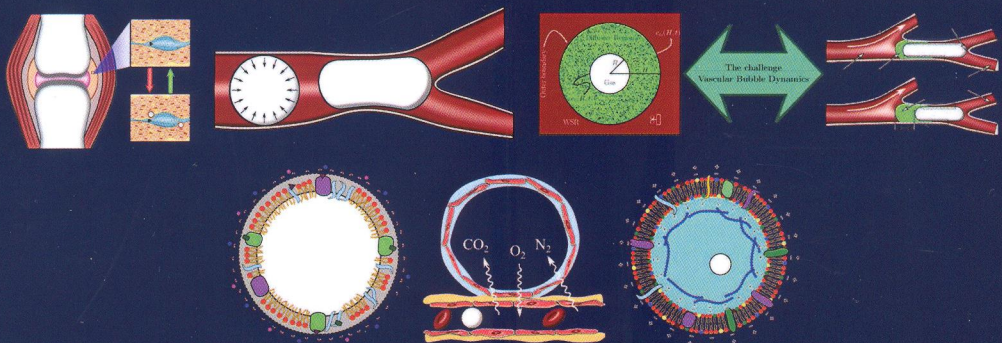
- Demonstrates how physical and mathematical tools help to solve underlying problems across physiology and medicine.
- Helps researchers extend their competence and flexibility to the point that they can personally contribute to the field of hyperbaric medicine and physiology, or to other related biological problems that may interest them.
- Provides clinicians with explicit examples of how mathematical modeling can be integrated into clinical treatment and decision making.

About the Authors

Saul Goldman is a Professor Emeritus in the Chemistry Department at the University of Guelph, Guelph, Ontario, Canada. Goldman is a highly cited researcher in statistical mechanics, transport theory, and simulations applied to atoms and molecules in fluid phases and to ions in ion channels. His group seeks to predict and understand the thermodynamic, structural, spectroscopic and transport properties of molecules, atoms and ions under conditions that are relevant to biology and engineering. Recent interests include the physics of gas bubbles in the body and developing improved biophysical models for preventing decompression sickness in scuba diving.

J. Manuel Solano-Altamirano is an assistant professor at the Autonomous University of Puebla, Puebla, Mexico. Solano-Altamirano is interested in interdisciplinary topics involving mathematics, physics, chemistry and high-performance computing. In particular, he is interested in the thermodynamic stability of elastic systems, gas bubble dynamics embedded in liquids and soft elastic media, studying the chemical bond from a quantum theory of atoms in a molecule perspective, and aspects of physical chemistry and mathematical modeling more generally.

Kenneth LeDez is Associate Professor in the Faculty of Medicine, Memorial University, Health Sciences Centre, St. John's, Newfoundland and Labrador, Canada. He is an anesthesiologist and former Research Director and academic Chair of the Discipline of Anesthesia at Memorial University. He is recognized as a Specialist in Diving and Hyperbaric Medicine by the Canada-Newfoundland and Labrador Offshore Petroleum Board and the Canada-Nova Scotia Offshore Petroleum Board. For over two decades he has represented Canada on the International Standards Organization committee (TC121) on Anesthesia and respiratory equipment. During his career, Dr. LeDez has published multiple articles and abstracts related to anesthesiology and hyperbaric medicine.



$$\frac{dR}{dt} = \frac{1}{3P_h R + 4\gamma}\left[3RTD\Re\left(\frac{\partial c}{\partial r}\right)_{R,t} - R^2\frac{dP_h}{dt}\right]$$

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