

PHYSICS, PHYSIOLOGY  
AND DECOMPRESSION  
THEORY FOR THE  
TECHNICAL AND  
COMMERCIAL DIVER

BY BRUCE WIENKE

PHYSICS, PHYSIOLOGY, AND DECOMPRESSION THEORY  
FOR THE TECHNICAL AND COMMERCIAL DIVER

B.R. Wienke  
Los Alamos National Laboratory  
Los Alamos, N.M. 87545



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**PADI**  
INSTRUCTOR 33913  
**Albrecht Salm**

ABSTRACT

Physics, physiology, and decompression theory in technical and commercial diving are important facets of training and education. Such diving is a dynamic and challenging activity, requiring more than just rudimentary knowledge and cursory attention to physical principles. This monograph attempts to fill many of the gaps in understanding the complex interplay of physical and biophysical principles impacting the technical and commercial diver. Hopefully, it will then serve both as a diving training tool and extended technical reference.

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## PREFACE

Technical diving used to be the preserve of just commercial and military divers. Today, highly motivated and well trained recreational divers are pushing diving to new depths, on mixed gases, with sophisticated electronic sensors and dive computers, using modern rebreathers, wearing special exposure suits, in the oceans, lakes, and at high altitude. This new breed of diver receives training from any one of a number of new technical agencies, like Technical Diving International (TDI), International Association Of Nitrox And Technical Divers (IANTD), and Association Of Nitrox Diving Instructors (ANDI), as well as the older recreational agencies, such as NAUI, PADI, YMCA, SSI, and NASDS. For the technical diver and working commercial diver, this monograph can be both a training tool and extended reference.

Diving physics encompasses a wide spectrum of related disciplines, from geophysics to biophysics, atmospheric physics to hydrodynamics, medical physics to engineering physics, and mathematical physics to statistical analysis. The scope is immense, and so any monograph has to be selective, and probably not in depth as possible. And diving physics can be a tedious exercise for readers. Obviously, physiology is an even more complicated mix of physics, chemistry, and biology. Like comments apply to decompression theory, a combination of biophysics, physiology, and biochemistry in a much cloudier picture within perfused and metabolic tissue and blood. Biological systems are so complex, beyond even the fastest and biggest supercomputers for modeling analysis. Often, the tedium relates to a proliferation of equations and deduced results.

So, selectivity without mathematical complexity is the direction we take here in narrative. Mathematical equations are kept at definitional level to facilitate description. The hope is to better encapsulate a large body of underlying physical principle in very readable form. Sample problems, with solutions, are included to enhance quantitative description and understanding. Topics are fundamental and chosen in their relevance to technical diving.

The monograph is directed at the technical diver, chamber operator, doctor, technician, commercial diver, EMT, boat captain, and other individual with technical background, and a real operational