



Sasho MacKenzie

# Three Dimensional Dynamics of the Golf Swing

A Forward Dynamics Approach with a  
Focus on Optimizing Shaft Stiffness



This book establishes a comprehensive understanding of the role that shaft stiffness plays in executing a golf drive. A thorough set of experiments was conducted to answer explicit questions related to this goal. Specifically, how does shaft stiffness affect clubhead speed and how does it alter clubhead orientation at impact? What are the underlying mechanisms responsible for the pattern of shaft deflection occurring during the downswing? For the first time, a 3D, 6-segment forward dynamics model of a golfer and club was developed to answer these questions. The golfer model was optimized for maximum clubhead speed using a genetic algorithm that determined the best activation pattern for the simulated muscles that provided energy to the system. High speed video data of shaft bending during the swings of actual golfers were collected to assess the validity of the model. In addition to the findings on shaft stiffness, the development of the model led to an understanding of the role that passive joint forces play in squaring the club for impact.

This book also serves as a solid introduction to forward dynamics modelling.



**Sasho MacKenzie**

Dr. Sasho MacKenzie is a biomechanics professor in the Department of Human Kinetics at St. Francis Xavier University in Nova Scotia, Canada. Dr. MacKenzie has focussed his research efforts on the biomechanics of the golf swing primarily through the use of three-dimensional computer simulation and optimization.



9 783639 085075

978-3-639-08507-5