THE "LAST WORD" ON THE GOLF SWING; HOOKS AND SLICES STILL UP IN THE AIR

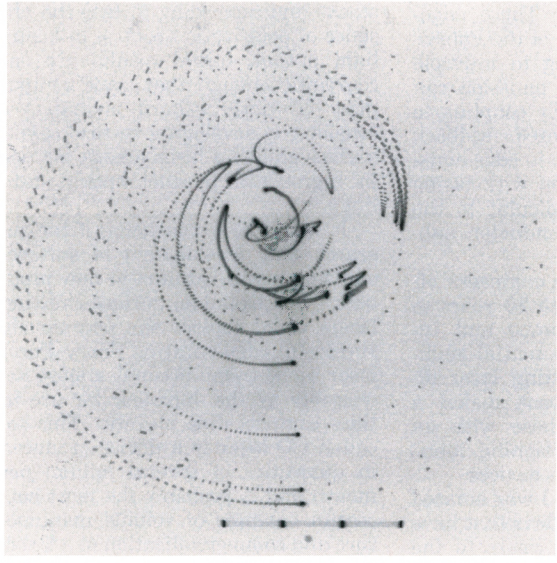
The Physics of Golf

Theodore P. Jorgensen
AIP, New York, 1994. 155 pp.
$35.00 pb ISBN 0-88318-955-0

Reviewed by Robert K. Adair

Americans watch baseball but play golf. Hence, on the shelves of the Yale Coop book department, there are ten books about baseball—about players and teams, great games and great seasons—to each one that would teach the game. But the golf books are, almost without exception, directed towards telling the reader how to play the game better. Theodore Jorgensen, professor emeritus at the University of Nebraska, whom many of us know for his significant contributions to the understanding of molecular collisions, is a golfer. As a result, notwithstanding a charming overlay of comments on the history and culture of golf and three chapters on the collision of club and ball, the flight of the ball and the handicap system, the heart of golfer Ted Jorgensen's delightful book lies in his analysis of the swing of the golf club and how, armed with insights from that analysis, you, he and I might all swing the club better and play better golf.

Jorgensen asks and largely answers the question, How does the player transfer energy to the head of the club? And he asks implicitly, and maybe answers, How can a player improve that transfer? Jorgensen's ingenious strobe photography shows that the energy transfer rate from player to club head reaches a peak of about seven horsepower at the bottom of the swing for a typical professional golfer and averages about two horsepower over the quarter-second swing time. With a maximum power output of about one horsepower per eight pounds of muscle, this energy must come largely from the large muscles of the thighs and thorax and not from the hands and wrists. With his modeling of the swing, Jorgensen tells us how that transfer is effected—and how those of us who are not on the Professional Golfers' Association tour might improve that transfer.



A near-perfect golf swing caught in a strobe photo. (Image courtesy of Theodore P. Jorgensen.)

The exposition is designed to be accessible to the casual reader while satisfying the critical student. Hence, the mathematics is complete but relegated to a non-intrusive support role, in technical appendices that make up about 20% of the book.

The physics of golf, like much sports physics, is deceptively difficult, and there are matters where my own analyses do not quite square with Jorgensen's. There is, at least, room for disagreement with some of Jorgensen's statements concerning the flight of the ball, the collision of the club and ball, the effect of spin on the drag, the difference between surlyn and balata balls, and a few other matters. I also take respectful issue with Jorgensen's describing as the Bernoulli effect the complex and poorly understood mechanisms that result in hooks and slices from a spinning ball. So familiar a label suggests a simple explanation, quantitatively useful and qualitatively reliable. But, since spinning, smoothed golf balls curve in a direction opposite to that of dimpled balls; the simple application of Bernoulli's insight doesn't even work qualitatively. Better call it the Magnus effect, which says nothing and misleads no one.

Eugene Wigner once told me that it was important to write the first paper on a subject and more important to write the last. In some areas of golf, where Jorgensen's conclusions are perhaps arguable, his book will still be the first significant statement; I suspect it may be about the last word on the swing. But first word or last, for anyone who has swung a golf club, the book is fun to read.

Robert K. Adair, Sterling Professor of Physics at Yale University, is the author of *The Physics of Baseball* (HarperCollins, 1991, 2nd Ed. 1994.)