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Gideon Ariel: A Pioneer in Biomechanics and Computer Science

Gideon Ariel, a doctorate holder in exercise science from the University of Massachusetts, has been using his expertise in computer science, mechanics, and engineering to solve problems related to athletic performance. As the chairman of biomechanics and computer science for the US Olympic Committee, he recently assisted the women's volleyball team in improving their jumping capacity through computer analysis of their movements.

Dr. Ariel uses computers to analyze and manipulate data related to the complex motions and interactions of human body segments and athletic gear. He has developed several methods to feed coordinates of points on a body into computers, including a scanning device that responds to light and dark areas of a projected photographic image and a sonic pen that uses sound to position body segments.

Dr. Ariel has applied his skills to a wide range of athletic activities through his private company, Computerized Biomechanical Analysis, Inc (CBA). Despite being an adjunct professor of computer science at the University of Massachusetts, he has shifted his focus to commercial projects. CBA has undertaken several projects for manufacturers, allowing Dr. Ariel to recover his investment in facilities.

Currently, Dr. Ariel is working on developing new, large exercise devices and is exploring the potential of computers in guiding athletes on workout routines, diet, and more.

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Below find a reprint of the 1 relevant pages of the article "Gideon Ariel, Computernik-Biomechanist" in "The Physician and Sportsmedicine":

Gideon Ariel, Computernik-Biomechanist

Gideon Ariel is a single-minded problem-solver, calling on the disciplines of exercise science (in which he received his doctorate at the University of Massachusetts), computer science, mechanics, and engineering to provide solutions for the problems of athletic performance. As biomechanics and computer science chairman for the US Olympic Committee he recently helped the women's volleyball team at Squaw Valley, who weren't jumping high enough. Using computer analysis of their movements, he and colleagues found that the volleyballers didn't have sufficient weight and strength in their arms, as compared with their legs, for the work of leaping. "They worked on it for six weeks," recalls the biomechanist, "increased their arm strength, and increased their jumping capacity quite a bit."

Dr. Ariel gets to the heart of

challenges like these by using the datagobbling, data-juggling talents of the computer, which if properly programmed, can analyze and manipulate data concerning the complex motions and interactions of human-body segments and athletic gear. Originally he labored to reduce limb and trunk movements to stick-figure representations from motion-picture photographs superimposed on each other. Finding the conventional ways tedious and time-consuming, he experimented with shortcuts. Now he feeds coordinates of points on a body into computers by several methods.

In one of them, a scanning device glances over a photographic image projected on a screen, responding to its light and dark areas. A computer connected to the scanner then plots the positions of joints to produce stick-figure tracings. Two other gadgets de-

pend on sound rather than light to position body segments on a cathode-ray tube or paper printout. In one technique, Dr. Ariel touches a "sonic pen" to a photographic image displayed over a kind of grid with tiny microphones around the edges. The microphones pick up sound impulses and measure how far away the source is; the computer converts the coordinates to visual images. From this, says Dr. Ariel, he can calculate the forces, velocities, and accelerations, if given the segment weights and distribution of body mass.

Restless and curious, Dr. Ariel has explored a broad spectrum of athletic activities—running, field events, diving, golf, basketball, football, ice skating, and tennis—at Computerized Biomechanical Analysis, Inc (CBA), his private company.

Although still an adjunct professor of computer science at the University of Massachusetts, he presently has little to do with pure research, having made a conscious decision in 1971 to steer a commercial course. CBA has taken on a number of projects for manufacturers so Dr. Ariel can recover his investment in facilities. "The money has to come from somewhere," he laments.

Although he's been consulted by professional teams in the past, he's not currently active in such work. He is, however, busy dealing with tennis rackets, golf clubs, and football helmets and jackets newly conceived to prevent injuries. Furthermore, he's absorbed in developing new, large exercise devices—he has contributed to the Universal, Nautilus, and Paramount equipment—perhaps even for home use. Someday, he speculates, the exercise machine's computer will describe how to work out to be a better tennis player, bowler, or orienteer, and in addition, tell the athlete what to eat and how much.

David Wheldon

Dr. Ariel with a computerized exercise machine.

