



Computer Expert Aims to Put Athletes Into Winner's Circle

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In 1984, Dr. Gideon Ariel, a computer expert and former Israeli Olympic team discus thrower, aimed to revolutionize athletic training with the use of computer technology. At the Coto Sport Research Center in Southern California, Ariel used high-speed cameras and computers to analyze the movements of athletes, turning the footage into stick drawings that showed body bones and joints. This allowed him to measure the acceleration and force of all body parts at any given point in the action. Ariel believed that this technology could help athletes improve their performance and potentially dominate the Olympics. However, he faced resistance from coaches who were slow to change their traditional training methods.

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Below find a reprint of the 2 relevant pages of the article "Computer Expert Aims to Put Athletes Into Winner's Circle" in "Hartford Courant":

Computer Expert Aims To Put Athletes Into Winner's Circle

L.A. Times Service
It is 1984. A high school coach arrives at the Coto Sport Research Center in Southern California with a promising-looking athlete, a 14-year-old freshman.

Purpose of the visit to learn which sport the youngster should spend his high school and college years mastering.

He spends 10 days at the center. Dr. Gideon Ariel measures the boy's bones, tests his reflexes, photographs him running, jumping and throwing with 10,000-frame-per-second movie cameras, examines his parents for genetic characteristics, tests his muscle strength on electronic weight-training machines, measures his jumping ability on force plates and checks his cardiovascular capacity and flexibility.

Tests completed, Ariel condenses a stack of computer printouts into a brief analysis that suggests the boy's best chance of sports success would be as a cyclist. Or a swimmer. Or a football player. Or a tennis player. Or a discuss thrower.

It would be rushing things to say Gideon Ariel has lifted American coaches out of the Stone Age and set them down in the 21st Century. Or forced them to turn in their whistles for computerized video display terminals.

For one thing, he says, many of them prefer the Stone Age.

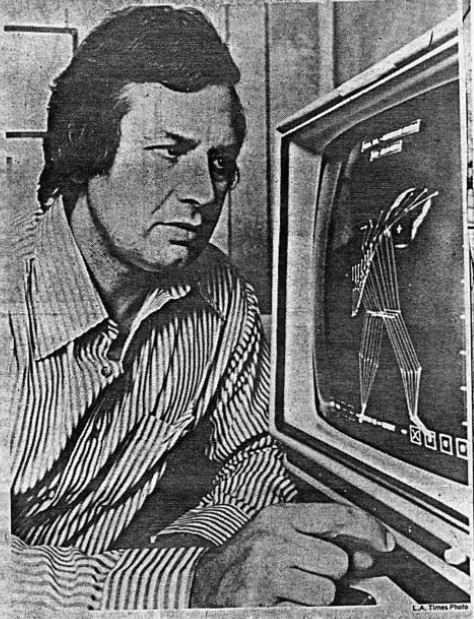
"It's incredible to me that the nation that put men on the moon is so slow to change its athletic training concepts," he said.

"But there are many experienced coaches who just don't like to be told they've been doing something wrong for years.

"Take the shot put, for example. We used to have three men on the Olympic victory stand. Now, none. Why? The East Europeans outcoached us, that's why.

"Computers show us the most effective way to put the shot is to use a short glide across the ring and a long follow-through. It's not witchcraft, or something too difficult to understand. It's high school-level physics. No engineer would build a bridge without calculating all the stresses and forces involved. Coaches should consider the same things when training an athlete.

American track coaches tend to agree that they've been slow to change to more scientific approaches, but bristle at the notion they resist innovation.



Training Concept

Computerized performance profile of a shot-putter in motion is studied by Gideon Ariel, who says that Computer Age techniques can help athletes perform better, but that many coaches seem to prefer the Stone Age.

Ariel says Olympic athletes from throughout the world will be tested there. Some other projected services:

- A golfer will be shown how to get 20 more yards off the tee (for \$1,500).
- NFL placekickers will be filmed and computerized. "I will find a way to get them to kick better."

extremely tall thrower with great speed. So you could say a Wilt Chamberlain-size athlete with 10.2 or 10.3 100-meter speed is capable of 275 in the discus.

"Similarly, the attributes of a 350-foot javelin thrower call for a 6-5 or 6-6 man with sprint speed, lightninglike

East Europeans do it. American coaches, generally speaking, coach a long glide and a short arm stroke.

"I compiled a complete report on the subject, containing indisputable evidence of this. It wasn't complicated or revolutionary. It was simply high school-level, Newtonian physics.

"You know what happened? A U.S. Olympic Committee coach took it from me, locked it up in his drawer and told me to my face he wasn't going to show it to anybody."

That's Gideon Ariel, the aerobic, 40-year-old former Israeli Olympic team (he's a U.S. citizen now) discus thrower who started tinkering with computers and high speed cameras 10 years ago. He's a two-time Ph.D. — in computer science and exercise science.

Today, he's director of computer science biomedicine at the U.S. Olympic Committee.

Ariel's method involves taking ultra-high-speed movie footage of an athlete performing. The frames are turned into stick drawings, showing body bones and joints. Eventually, a sequential "cartoon" of the action is created, enabling a viewer to measure acceleration and force of all body parts at any given point in the action.

"How can a coach teach, say, a javelin thrower how to release the javelin when he's never seen a release?" Ariel asks. "The human eye can't see it — it occurs in a fraction of a second."

Few people on earth can see track and field like Gideon Ariel can. To the spectator in a stadium, few sights can rival the majesty of a javelin soaring 300 feet through the air.

But to Ariel, the true beauty of the moment lies in that unseen fraction of a second when the javelin leaves the human hand, when the athlete brings eternal truths of physics to bear on the spear.

Ariel worked seven years at his Computerized Biomechanical Analysis Inc. lab in Amherst, Mass. But he's moved west. Ground will break soon at Coto de Caza, a private club in the foothills of Orange County, south of Los Angeles, for the multi-million-dollar Colo Sport Research Center.

Young athletes will be directed into sports most suitable for their natural ability and potential.

Tennis players will be shown how to deliver a faster serve.

Ariel has personally tested a lot of noted athletes and fed data into his computers. But he also can father data from ordinary movie films and videotapes. Here are some random Ariel observations, based on his studies of athletes in different sports:

RENALDO NEHEMIA H., high hurdler, pending world record holder — "He could win the gold medal in the 100-meter dash. His hurdle technique really isn't that good. It's not as good as Hayes Jones' or Lee Calhoun's. But he's a tremendous, natural sprinter."

WOMEN'S VOLLEYBALL — "Some of America's best female athletes are volleyball players on the U.S. national team. Two of them I've tested could be world-class javelin throwers or high-jumpers. As for volleyball, we showed them that, as soon as they stop telegraphing their hits at the net, they'll start winning more international matches."

FRANKLIN JACOBS, 7-7 U.S. high jumper — "Look at Jacobs on the screen and what's interesting about him is not his height (5-8), but his knees. He only has 90-degree flexibility in his knees, which means he doesn't have to lock his knee on takeoff. He's driving off a structure, in effect. It's a great advantage to him."

"By the way, the computer shows that the most efficient way of high jumping is to approach the bar straight-on, instead of the side, take off on one foot and go over belly down. Why no jumpers have tried it, I don't know."

VALERIE BRUMEL, Soviet ex-high jumper world record holder — "Using the flop, he would've jumped 7-11."

U.S. CYCLISTS — "American cyclists we tested were pulling up on the handlebars while driving the pedals down. The Europeans are pushing down on both. That's why they win and we lose."

U.S. KAYAKERS — "On the paddle stroke, the maximum force is created on the

increasing the error margin."

CREW — "In an eight-man shell, the shell will go faster if the oarsmen row in a two-two-two sequence. Instead of all at once. There will be a higher average velocity. The problem is, it's a difficult stroke pattern to coordinate."

ATHLETIC SHOES — "Some of the advertising claims by manufacturers are absolutely ridiculous. No one has come close to the optimum shoe. The day will come when computerization can design the perfect shoe for any athlete. It may be an inflatable shoe."

WEIGHT TRAINING — "The next breakthrough will be electronic weight training, where resistance is programmed. It will enable an athlete to lift 'around' an injury. Let's say he has a chest muscle injury and wants to bench press. At the point of peak pain, the resistance drops way down, then goes up again."

"Generally, weight training has been over-emphasized by U.S. coaches. And technique hasn't been emphasized enough. Vasily Alexeyev may be the strongest man in the world but he couldn't put the shot 50 feet. What does that tell you?"

"I should take part of that back. Bruce Wilhelm (U.S. weight lifter) is as strong as Alexeyev, he exerts the same force. But Alexeyev's technique is much better."

ANN MEYERS, woman basketball standout — "She has the potential to break the women's world record in the high jump. She can raise her center of gravity 60 centimeters in a vertical jump."

TOPSPIN — "In tennis, there's no such thing as putting topspin on a ball with the racket. It's impossible. The ball is only on the racket for one-thousandths of a second. Toppin occurs on the bounce. You can take some spin away from a ball with the racket, though."

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strong it could withstand blocking forces right to the point where they begin to break apart the bones."

In his Coto de Caza condominium, Ariel, a big, beefy man, was leaping nimbly around his living room, demonstrating to a visitor the U.S. and East European shot put and hammer throw styles. He initiated a weight lifter, snatching a barbell. Next he was stroking a kayak.

Then he sat down, swallowed a tall orange juice in three gulps, and talked about America in the Olympics, past, present and future.

"The last Olympics where athletes could win gold medals on sheer talent was 1964," he said. "Those days are gone forever. But if we apply computer technology to athletic training, there is no limit to what we can achieve. We could again dominate the Olympics, with our technology."

"Look at East Germany. How many people, 17 million? Yet they won more medals at the last Olympics than some continents. (Total medals for the top three countries at the '76 Olympics: U.S.S.R. 125, U.S. 94, East Germany 90.)

"I know some claim the East Europeans are using drugs. And they may be. But they're using technology, too. With the technological approach to training, the potential for improvement is far greater than it is with drugs."

"My point is, East Germany decided to go to the science-technology route in athletic training and look what happened. We stuck with our old ways. My hope is our lab here will start a revolution in sports training."

"It's not witchcraft, or something too difficult to understand. It's high school-level physics. No engineer would build a bridge without calculating all the stresses and forces involved. Coaches should consider the same things when training an athlete.

American track coaches tend to agree that they've been slow to change to more scientific approaches, but bristle at the notion they resist innovation.