Esquire's Olympic Preview

How To Know A Perfect Performance When You See One


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Esquire's Olympics Preview: How To Know A Perfect Performance When You See One
by Gerald Astor

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In the July 1976 issue of Esquire, Gerald Astor provides an in-depth preview of the upcoming Olympics in Montreal. The article, titled "How To Know A Perfect Performance When You See One," explores the pursuit of perfection in various athletic events. Astor discusses the role of technology in analyzing and improving athletic performance, highlighting the work of Israeli-born Gideon Ariel, who uses computerized biomechanical analysis to optimize athletic performance. The article also features insights from Muriel Grossfeld, a three-time member of the U.S. Olympic women's teams, on the intricacies of gymnastics scoring. Astor's piece offers readers a deeper understanding of the mechanics and dynamics of athletic performance, enhancing their appreciation of the upcoming Olympic games.

The article discusses the techniques and tactics used by athletes in various sports. It highlights the turning tactic used by Oldfield in shot put, which adds the potential of centrifugal force, resulting in a longer throw. The article also introduces the Tsukahara vault, created by Japanese gymnast Mitsuo Tsukahara, which debuts as a female exercise at the Montreal Games. The vaulters are allowed two tries and one free run as long as they abort before they touch the horse. The article also discusses the stag split leap and the aerial walkover, two exercises in balance-beam performance. The stag split leap is a compulsory exercise that also serves as an optional movement, while the aerial walkover is an optional exercise that requires great concentration and a strong initial drive.

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Below find a reprint of the 8 relevant pages of the article "Esquire's Olympic Preview" in "Esquire Magazine":

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Esquire's Olympics Preview: How To Know A Perfect Performance When You See One

by Gerald Astor

On July 17, to the accompaniment of booming cannons, flapping pigeons and assorted noise from the likes of the queen of England, a billion-dollar tribute to the pursuit of perfection opens at Montreal under the title of the Games of the XXI Olympiad. For the following fifteen days, ABC's TV cameras will long-lens, slow-motion, instant-replay, split-screen and stop-action the world's greatest athletes, who will run, jump, twist, heave, stroke, guide, steer and shoot in an orgy of excellence.

But perfection rarely holds still enough to be anatomized by a camera lens. Indeed, until commentator Jim McKay or his ilk advises us of the time, or a camera flashes on the scoreboard, we won't know whether a U.S. sprinter like Steve Williams has run a world record hundred meters or the Soviet Union's Olga Korbut has outdone Nadia Comaneci of Romania in the optional floor exercise for women gymnasts.

Even more significantly, the camera cannot show the mechanics employed by a body to produce a perfect shot put or a perfect Tsukahara vault. TV supplies a highly pleasurable caress to the visual sense—the same way Beethoven's Ninth Symphony provides an orgy of delight for the unschooled ear. But the enjoyment of athletics—as well as of music—increases with an intellectual knowledge of the dynamics, whether it is Beethoven's manipulation of notes or Terry Albritton's manipulation of muscle tissue to move the shot seventy-one feet.

In track and field, perfection rests upon the most efficient application of muscle. force to segments of the body. Until recently, techniques for running, jumping and throwing improved haphazardly, mainly as a result of a challenger observing the style of a champion.

In track and field, perfection rests upon the most efficient application of muscle force to segments of the body.
(Pages 41, 43, 45 and 47)

Shot-putters adopted the ways of Parry O'Brien in the 1950's until the latest generation of iron-ball men discovered by trial and error that a martini is not the only thing that's improved by a twist. The Western roll sufficed for the high jump until the straddle leapers reached higher altitudes. And now the flop method, which benefited from a rule change that permits the head to lead, owns the world record.

But where these refinements have all come out of guesswork and experimentation, science is now on the case in the person of Israeli-born Gideon Ariel. As director of research for Computerized Biomechanical Analysis in Amherst, Massachusetts, Dr. Ariel's chief business is testing and designing athletic equipment that maximizes effective force. Since 1972, he has also been photographing athletes and feeding this visual data into a computer, which in turn spews out a graphic report in terms of force, direction of force, acceleration and velocity of body parts. The computer readouts give a quantitative measure of motion, from which Ariel sees what's necessary to perfect or optimize an athletic performance. The only limitations are those of muscle and ligament. Using data from medical science, Ariel knows at what point the forces exerted begin to tear human tissue.

What wins on paper, however, often runs out of the money at the track—except that Ariel has already astonished a number of expert skeptics. Last November he watched Mac Wilkins, a discus thrower (Ariel's own event as a 1964 Israeli Olympian). "Based on calculations I made," says the biomechanical engineer, "I could see Wilkins dissipated too much muscular force overcoming the friction between his shoe and the ground. I told him to pour water on the ground where his foot rested. He threw about two hundred thirty feet immediately. Until then, his best was two hundred fourteen feet. The water reduced the friction drag. A different shoe, one that lowered rotational friction, would have brought the same results.

"I also analyzed Bill Schmidt, the javelin thrower. The computer information indicated he lost force because he dropped his hip. After I pointed that out, Schmidt reached more than three hundred feet, much better than he had ever done."

Last year Ariel studied Kansas City Royals pitcher Steve Busby. "He's getting maximum velocity on the ball with his form," Ariel remarked to the Royals coaches. "But he's going to have trouble with his knee; there's too much stress on it." The K.C. coaches turned pale. They thought Busby's knee problems were a well-kept secret in Kansas City.

With his computations Ariel proves in the following pages that 1936 triple gold-medal winner Jesse Owens actually ran as fast as any current sprinter. Owens, however, was penalized by a slow track. Ariel shows that Soviet high jumper Valery Brumel could leap over eight feet if he'd just pay attention to Ariel's physical principles. According to Ariel's charts, one hundred feet is within reach of modern shot-putters. Finally, Ariel buries that hoary athletic maxim that perfection requires follow-through; he says it is actually counterproductive.

In one Olympic category, gymnastics, perfection is achievable, mainly because scores are rendered by judges, who may award, if they're so inclined, the highest possible marks to a performer. But when you watch these events on TV, you really can't tell why one exercise is worth a perfect ten while another one, equally amazing to the viewer, registers a less than perfect 9.75.

Muriel Grossfeld, herself a three-time member of the U.S. Olympic women's teams and now the coach for all entries at Montreal, notes some of the subtleties that escape the camera. "The body must look elastic; at times you must have the quality of dance. The suppleness cannot be just in the legs but in your entire appearance. Difficulty isn't all that counts. A gymnast must be able to move forward, backward and sideward."

When you watch gymnastics on TV, you can't tell why one exercise is worth a perfect ten while another registers a less than perfect 9.75.
(Pages 49 and 51)

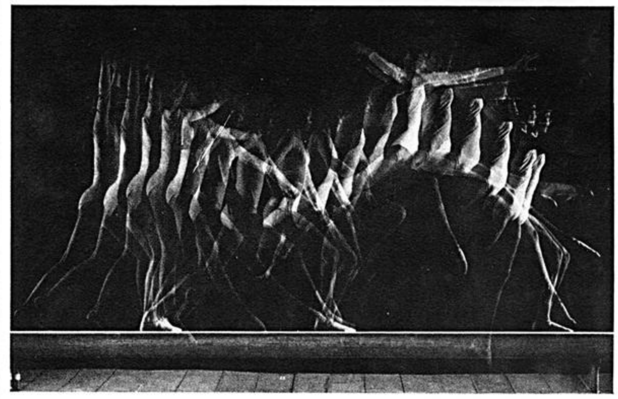
She points out that perfection is not a relative quality; a routine movement executed properly scores a ten the same as a much trickier stunt done exactly right. Actually, in women's gymnastics, unlike the male competition, a flub during a movement of great difficulty is supposed to cost more than a similar error on an easier stunt. The principle is that a woman should not stretch beyond her competence.

Currently training a crop of gymnasts in a converted supermarket in New Haven, G-ossfeld observes that there is a definite advantage for the ninety-pound Korbuts and Comanecis of the world. "Their tumbling radius is so much less than that of tall girls that they can do more in the limited space of a floor exercise. On the balance beam they also have more room to work since they cover less distance with each movement. On the uneven bars if you're tall you come closer to the floor and the bars can be adjusted to accommodate better someone under five feet." Even in training the flyweight females have an edge. They can begin vaults and balance-beam practice sooner than their heavier counterparts because "catchers" can protect them more easily when they miss.

"Tall or long-legged girls seem more graceful," says Grossfeld. On the other hand, the premium on the lower half of the body works against women with big shoulders—and a bosom is just excess baggage.

So let the Games begin, and for the perfections discovered by Gideon Ariel and explained by Muriel Grossfeld, the ones you won't see on the TV screen, read on.

Gerald Astor is currently working on a book about the F.B.I.



Photographed by Ben Rose

Esquire's Olympics Preview:

THE PERFECT HUNDRED METERS
Current world record: 9.9 sec.
Projected outer limit: 9.6 sec.

Three factors determine speed in a sprint. The first is the condition of the track. If it's soft, or if it's slippery, horizontal force is absorbed or lost. If the track is hard and springy, none of the leg drive is dissipated. The second determinant is what Gideon Ariel calls "angular displacement of the leg joints." Whether it's an Olympic sprint or a slow walk to the bar, forward movement results from bending the three segments of the leg—hip to knee, knee to ankle, ankle to ball of the foot—from the horizontal plane. In mechanical terms, the total amount of angular displacement of these leg segments in a given period of time is a measure of how fast the leg is traveling.

The third element in sprint speed is the length of the leg segments. A sprinter with longer limbs covers more ground in each stride, although his angular displacement per moment in time may be the same as or even less than that of a shorter competitor.

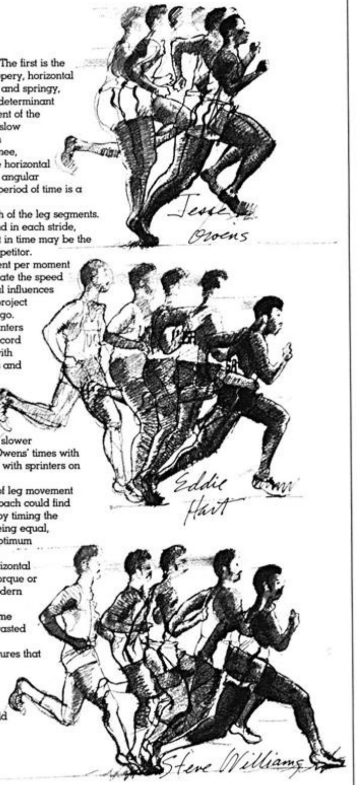
Thus, by measuring both angular displacement per moment in time and leg length, Gideon Ariel can calculate the speed of an athlete regardless of the effects of external influences such as track conditions or wind. He can thus project sprint perfection, beyond which a human can't go.

Eddie Hart and Steve Williams, two U.S. sprinters who have equaled the hundred-meter world record of 9.9 seconds, were compared on computers with Jesse Owens, whose best time was 10.2. Owens and Hart, both under six feet tall, showed an equal angular displacement. Williams, close to three inches taller than the others, moved his legs slower but covered more ground each step. Gideon Ariel's analysis: a triple dead heat of 9.9 if Owens—who ran on a slower track—faced Hart and Williams. "Comparing Owens' times with theirs is like matching a man who runs in sand with sprinters on a hard-surface road," says Ariel.

What makes the ultimate sprinter? Rapidity of leg movement is a function of the neuromuscular system. "A coach could find the most promising sprinters," remarks Ariel, "by timing the knee-jerk reflex of candidates." Other things being equal, longer legs with a smaller torso provides the optimum sprinter physique.

Although arm movement does add to the horizontal force, its primary function is the prevention of torque or wobble due to hip rotation. What does limit modern competitors are spiked shoes. These overcompensate for possible slippage. Every time those spiked shoes dig into the track, force is wasted pulling them out.

If all external conditions were ideal, Ariel figures that with a ten-percent increase in leg length over that of the best contemporary sprinters, and with ten percent more muscle power than shown to date, a 9.6 hundred meters or an 8.8 hundred yards is possible. Greater speed would probably tear muscles, even break bones.



Illustrated by Andrew Moszynski

Esquire's Olympics Preview:

THE PERFECT HIGH JUMP
Current world record: 7 ft. 6½ in.
Projected outer limit: 8 ft. 10 in.

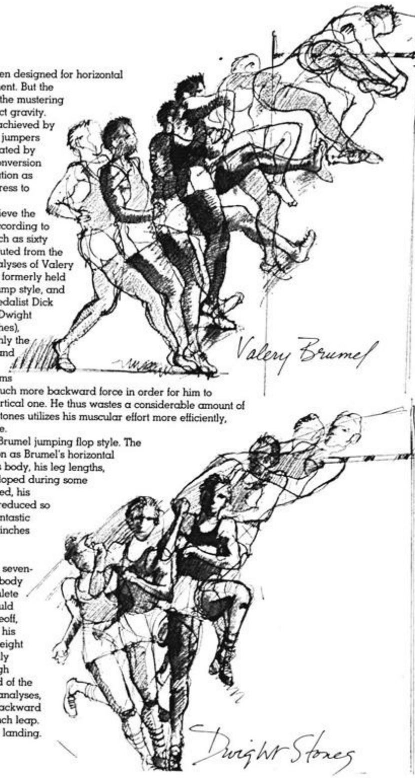
Humans appear to have been designed for horizontal rather than vertical movement. But the essence of the high jump is the mustering of enough vertical force to counteract gravity. To boost the limited upward thrust achieved by simply pushing off the ground, high jumpers convert their horizontal velocity, created by running, into a vertical force. The conversion technique requires sudden deceleration as the athlete brakes his forward progress to change direction.

Several factors are critical to achieve the maximum effective vertical force. According to Gideon Ariel's computations, as much as sixty percent of the power can be contributed from the free-swinging leg and arms. His analyses of Valery Brumel, the Soviet high jumper who formerly held the world record using a straddle jump style, and of the two top floppers, 1968 gold medalist Dick Fosbury and current record holder Dwight Stones (seven feet six and a half inches), indicate that all three produce roughly the same force by using their free legs and arms.

However, as the computer diagrams show, Brumel's straddle demands much more backward force in order for him to convert his horizontal drive into a vertical one. He thus wastes a considerable amount of power. On the other hand, Dwight Stones utilizes his muscular effort more efficiently, wasting much less in backward force.

Ariel simulated, on his computer, Brumel jumping flop style. The simulation employed such information as Brumel's horizontal velocity, the speed of segments of his body, his leg lengths, the muscular force that he had developed during some of his leaps. When Brumel flop jumped, his backward force or inefficiency was reduced so much that he cleared the bar at a fantastic seven feet eleven inches, almost five inches more than the world record.

Ariel calculated that the force manufactured by the takeoff leg in a seven-foot jump approximates seven times body weight, about 1330 pounds for an athlete who weighs 190. If Dwight Stones could generate 1750 pounds of force at takeoff, which is not unreasonable in view of his physical conformation, he could flop eight feet four inches. But what would totally destroy the accepted limits for the high jump would be a forward roll instead of the backward flop. According to Ariel's analyses, a dive-style jump with its minimum backward force would bring an eight-foot-ten-inch leap. The only problem might be the crash landing.



Illustrated by Andrew Moszynski

Esquire's Olympics Preview:

THE PERFECT LONG JUMP
Current world record: 29 ft. 2½ in.
Projected outer limit: 29 ft. 5 in.

The long or broad jump combines both the sprint and the high jump in a fusion of horizontal and vertical forces. The union of the two expressions of force optimizes at an angle somewhat less than thirty degrees from the horizontal. Theoretically the best ballistic angle would be forty-five degrees, but the angle must be cut down because an erect human starts his flight with his center of gravity already several feet off the ground. This principle, incidentally, holds true for the best angle of flight with the javelin.

Evidence of what makes near perfection in the long jump exists in the most incredible performance in the history of track and field. At Mexico City, in 1968, Bob Beamon of the U.S. jumped twenty-nine feet two and a half inches, more than a full foot beyond anything done before or since.

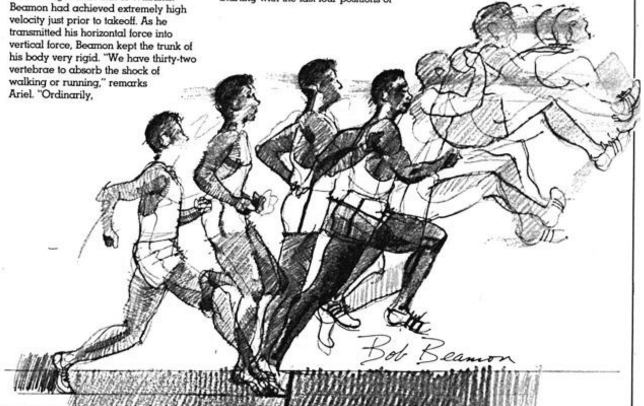
Using films of Beamon's jump, Ariel compared him on the computer with Randy Williams, the 1972 gold medalist. Beamon's final stride was one and a half inches longer than that of Williams. Beamon had achieved extremely high velocity just prior to takeoff. As he transmitted his horizontal force into vertical force, Beamon kept the trunk of his body very rigid. "We have thirty-two vertebrae to absorb the shock of walking or running," remarks Ariel. "Ordinarily, even the best long jumpers collapse the trunk slightly as they absorb the shock at takeoff in the vertebrae."

Beamon's ability to handle the forces without absorbing some in his joints is all the more remarkable since he fused the forces from various segments of his body within .075 seconds from the time his foot touched the board. Other jumpers required at least one tenth of a second or more. Thus, Beamon's linkage integrated a series of motions and combined more than one hundred sources of force in a near perfect piece of synchronization.

His free leg contributed as much as thirty-five percent to Beamon's performance because of the jumper's effective deceleration of the limb. As Isaac Newton proved, when a moving object suddenly slows, the force within it must go somewhere. For example, throw your fist in the air. Stop the punch abruptly and you will feel the force in other areas of your body. But if you simply permit the arm to extend fully, you will experience little sense of the force in your body. Starting with the last four positions of Beamon's free leg, the computer diagram of Beamon shows its movement slowed radically. The deceleration force went into the jump.

Beamon's swinging arms served two functions. Prior to lift-off he decelerated them to add more force, as with his free leg. During his flight, the arms added no power but helped retain balance.

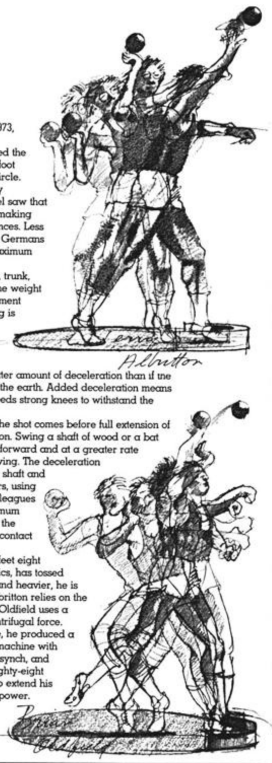
Ariel's computer indicates Beamon rolled up 1700 pounds of force in his hip joint. Medical research suggests that at this level, the average muscle attachments to the hip will tear. Therefore, it is unlikely any human can significantly improve on the amount of force manufactured by Beamon. When Ariel put all of the data into the ideal long jump, he found that a twenty-seven-degree launch, one degree more than Beamon's, would be optimal. It still would add only a tiny increment to the jump. Beamon's record probably will be unsurpassed in the near future.



Illustrated by Andrew Moszynski

Esquire's Olympics Preview:

THE PERFECT SHOT PUT
Current world record: 71 ft. 8½ in.
Projected outer limit: 100 ft.



While wandering among the athletes at a meet in Spain in 1973, Ariel paused to watch some East Germans put the shot. He noticed that contrary to accepted practice, the Germans heaved the sixteen-pound weight with the back leg off the ground and the front foot coming all the way to the bucket or toe guard that rims the launch circle. Innocently, Ariel pointed out the flaws to East German coaches. They promised to initiate measures to reform their deviants. However, Ariel saw that for all the talk, the East Germans kept right on lifting that back leg, making sharp contact with the toe guard and throwing the shot goodly distances. Less blessed with sophisticated systems for biomechanical study, the East Germans had nevertheless discovered a precious asset for putting the shot: maximum deceleration.

The shot put involves a linkage of forces generated by legs, thighs, trunk, shoulders and arms into a united push against the ball. Just before the weight leaves the hand, the athlete suddenly decelerates. He halts his movement forward and applies the resultant force to the shot. When the rear leg is on the ground at the moment of deceleration, some of the force dissipates into the earth. But when the back leg lifts off, the forces in it must travel through the body. Force that might have gone into the ground goes to the shot.

When the front foot smacks against the toe guard, it causes a greater amount of deceleration than if the athlete merely slowed himself by means of the friction of his shoe on the earth. Added deceleration means more force. One caution on the East German style: the shot-putter needs strong knees to withstand the shock of the deceleration.

Equally significant, Ariel's study shows that maximum force upon the shot comes before full extension of the arm, in the tradition of follow-through. It's analogous to whip action. Swing a shaft of wood or a bat or golf club. Stop your swing suddenly. The tip of the shaft will whip forward and at a greater rate of acceleration than if you had simply followed through with a full swing. The deceleration applied by arresting your arms is transmitted along the length of the shaft and manifested at the tip. That explains why slightly built baseball players, using thin-handled, whippy bats, hit home runs as well as their heavier colleagues equipped with massive bludgeons. Follow-through comes after maximum force has been brought to bear and it adds nothing. It may program the athlete for the proper swing or throw but it detracts if the moment of contact or release occurs after application of optimum force.

Although Terry Albritton holds the amateur record of seventy-one feet eight and a half inches, Brian Oldfield, a pro and ineligible for the Olympics, has tossed seventy-five feet. Oldfield's superiority rests on two features. Bigger and heavier, he is potentially stronger than Albritton. His second benefit lies in style. Albritton relies on the Parry O'Brien technique, straight-line steps across the launch circle. Oldfield uses a turning tactic, akin to the discus style, and it adds the potential of centrifugal force.

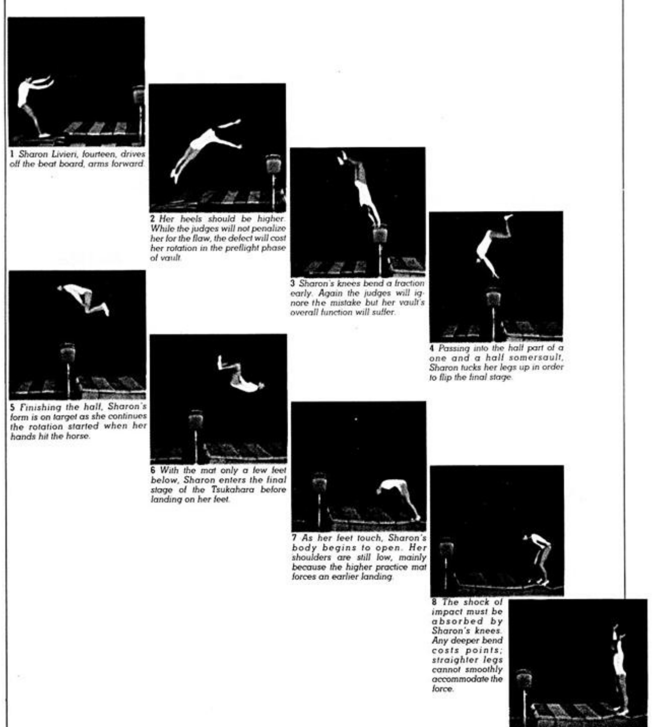
When Ariel ran Albritton through his computer with a turning style, he produced a seventy-six-foot throw. But when Oldfield was programmed into the machine with ideal conditions, back leg up, front foot to the bucket, the linkages in synch, and using muscle force that he has previously shown, Oldfield "threw" eighty-eight feet. Furthermore, according to Ariel, the more that Oldfield is able to extend his arm out from his body as he whirls to throw the shot, the greater his power. If he can build up his chest, shoulder and arm muscles to sustain the extension, Oldfield could reach a whiz-bang one hundred feet.

Illustrated by Andrew Moszynski

Esquire's Olympics Preview:

THE PERFECT TSUKAHARA VAULT

Created by Japanese male gymnast Mitsuo Tsukahara a few years ago, the **Tsukahara vault** over the side horse debuts as a female exercise at the Montreal Games. Vaulters are entitled to two tries and are permitted one free run so long as they abort before they touch the horse.



1 Sharon Livieri, fourteen, drives off the beat board, arms forward.

2 Her heels should be higher. While the judges will not penalize her for the flaw, the defect will cost her rotation in the preflight phase of vault.

3 Sharon's knees bend a fraction early. Again the judges will ignore the mistake but her vault's overall function will suffer.

4 Passing into the half part of a one and a half somersault, Sharon tucks her legs up in order to flip the final stage.

5 Finishing the half, Sharon's form is on target as she continues the rotation started when her hands hit the horse.

6 With the mat only a few feet below, Sharon enters the final stage of the Tsukahara before landing on her feet.

7 As her feet touch, Sharon's body begins to open. Her shoulders are still low, mainly because the higher practice mat forces an earlier landing.

8 The shock of impact must be absorbed by Sharon's knees. Any deeper bend costs points; straighter legs cannot smoothly accommodate the force.

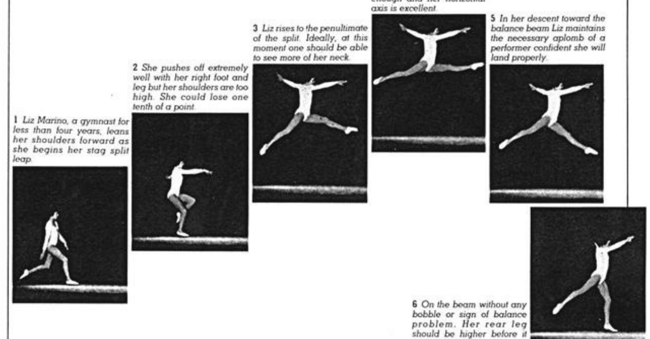
9 The final ritual of the vault calls for the gymnast to snap to a salute.

Photographed by Ben Rose

Esquire's Olympics Preview:

THE PERFECT STAG SPLIT LEAP
THE PERFECT AERIAL WALKOVER

The **stag split leap** is a compulsory exercise that is also used as an optional movement in balance-beam performance. Though it only vaguely resembles its opposite number in ballet, it still suggests dance, not traditional acrobatics.



1 Liz Marino, a gymnast for less than four years, leans her shoulders forward as she begins her stag split leap.

2 She pushes off extremely well with her right foot and leg but her shoulders are too high. She could lose one tenth of a point.

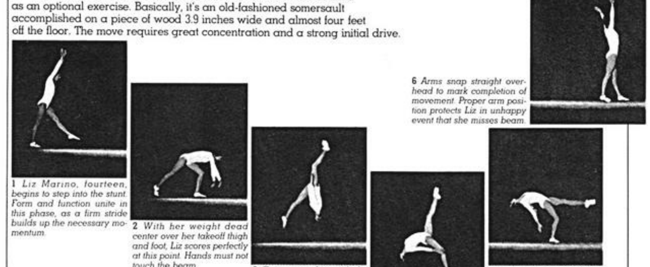
3 Liz rises to the penultimate of the split. Ideally, at this moment one should be able to see more of her neck.

4 She achieves impeccable split amplitude. She is high enough and her horizontal axis is excellent.

5 In her descent toward the balance beam Liz maintains the necessary aplomb of a performer confident she will land properly.

6 On the beam without any bobble or sign of balance problem. Her rear leg should be higher before it swings forward.

First seen extensively in the 1972 Olympics at Munich, the move known as an **aerial walkover on the balance beam** is classified as an optional exercise. Basically, it's an old-fashioned somersault accomplished on a piece of wood 3.9 inches wide and almost four feet off the floor. The move requires great concentration and a strong initial drive.



1 Liz Marino, fourteen, begins to step into the stunt. Form and function unite in this phase, as a firm stride builds up the necessary momentum.

2 With her weight dead center over her takeoff thigh and foot, Liz scores perfectly at this point. Hands must not touch the beam.

3 Going over, Liz might be docked a tenth of a point because she has allowed her swinging right leg to become slightly bent.

4 Correcting the flaw, she gyrates toward the finale of the movement with the proper confidence that her right foot will hit the beam.

5 Liz lands somewhat heavily, which is generally not perceived as a flaw. A more tentative touchdown would require balancing and induce a bad wobble.

6 Arms snap straight overhead to mark completion of movement. Proper arm position protects Liz in unhappy event that she misses beam.

Photographed by Ben Rose