



# FASTER HIGHER SMARTER

**BRIGHT IDEAS THAT  
TRANSFORMED SPORTS**



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To my wife, Sheryl. I couldn't have done this without you.

—S.S.



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# INTRODUCTION



“Faster—Higher—Stronger.” That’s the motto of the Olympic Games, and it’s a great one. It captures the idea that humans can and should push themselves to new heights and be the best they can possibly be. But is it possible that the motto is missing something important—a word that can help us not only reach those heights but soar beyond them? Since we can’t just change the Olympic motto with the snap of a finger, we gave this book the title of *Faster Higher Smarter*.

When it comes to athletic achievement, “smart” is often overlooked. It shouldn’t be. Sure, there are athletes who have a ton of natural talent and athletes who train harder than the rest. And they’re amazing. In fact, they often break records, but usually by just a fraction. This book is about people who are even *more* amazing—the innovators whose ideas changed sports by *a lot*.

Some were great athletes. Others were just average. And one was awful (but he sure loved—and changed—two different sports). Some weren’t athletes at all. They were scientists and farmers, teachers and security guards, and bright kids who just experimented and discovered things.

But that’s only half the story. If you think that sports are fun and science is dull, you have another think coming.

Whether the innovators knew it or not, science is the secret behind most of their work. And once you understand the science behind what’s going on, you’ll look at sports differently.



- **You'll see the connections between slap shots and pole vaulting, or swimming and ski jumping.**
- **You'll know that how you sit on a bike is more important than how hard you pedal.**
- **You'll see how statistics and analysis can be used to build a winning baseball team.**
- **You'll understand how to go over a high jump bar by going under it (kind of).**
- **You'll appreciate that not all innovations are positive (and that some aren't actually innovations at all!).**



When someone comes up with a great new idea, everyone rushes to copy it. Right? Not really! Athletes can be quick or slow to jump on board, depending on how hard it is to change their old habits. And the officials who make up the rules? They're a pretty indecisive bunch. Sometimes they accept the new idea, sometimes they ban it immediately, and sometimes they wait a few years before making up their minds.

But none of that seems to matter. Athletes will always push themselves to be better, whether they are competing in the Olympics or in a local skateboarding contest. Think about how you feel when you're about to play a friendly game of soccer with your friends or swim a few laps in the neighborhood pool. You want to have fun, for sure, but you also want to be the best that you can be. You want to score (or save!) one more goal than you did the last time or shave a few seconds off your time. That desire to improve—to be faster, higher, stronger—is why innovation is here to stay.



# HIGH JUMP THE FOSBURY FLOP

Summer Olympics, Mexico City, October 1968. An energetic crowd turns out to watch the final day of track and field. Although they don't know it yet, they are in for a wild ride. The Olympic Committee declares that the high jump final will start at a height of 6 feet 6 inches. This is quite low for an international competition, and the decision guarantees the crowd a long event—plenty of time, as it turns out, to notice the guy with the awkward-looking style. Instead of running straight toward the bar and jumping over

sideways, like everyone else, this athlete runs in a curve and ends up alongside the bar. Then he jumps over backwards, with his head first, landing on his shoulders! And that isn't all: before his run, he rocks from one foot to the other—forward and back, forward and back—for what seems like forever. And why is he wearing one black shoe and one white? At first the crowd laughs whenever he takes his turn, but before long, the laughs turn to cheers, and the crowd knows the strange competitor's name: Dick Fosbury.

In high jump, three failures in a row and you're out. By the fifth round of this competition, five of the 13 finalists are gone, and Fosbury is one of only two jumpers who haven't missed a single jump. Rounds six through

Dick Fosbury on his way to a gold medal in the Mexico City Olympics



eight eliminate another five. Fosbury and his American teammate Ed Caruthers remain, along with Russian Valentin Gavrilov. The nationalities of the final three are no surprise to fans of the sport: since 1887, only American or Russian jumpers have held the world record. All three men make 7 feet 3 inches in round nine. Then Gavrilov fails three times in round 10, with the bar at 7 feet 4 inches. Caruthers makes it on his second attempt, and Fosbury on his first. He has yet to miss a single jump.

Round 11: both jumpers fail their first two attempts at 7 feet 4 inches. Fosbury readies himself for his third try, rocking back and forth, focusing on the jump. Then comes

The **SCISSOR JUMP** is a simple style where you take off on the outside foot (farthest from the bar) and lift first one leg, then the other over the bar.

his unique run, curving to the right, and—liftoff!—he sails over the bar with inches to spare. When Caruthers fails his third attempt, the gold medal is Fosbury's—and high jump competitions have a whole new look.

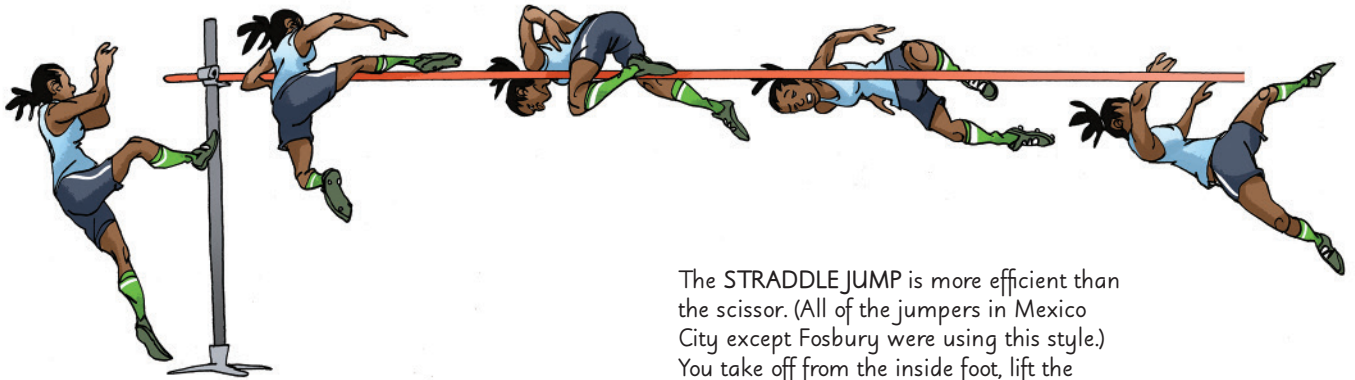
## GOOD, BETTER, BEST

Dick Fosbury's strange style took the high-jumping world by storm. By the next Olympic Games, four years later, most high jumpers were using what had become known as the "Fosbury flop." But what did it replace? Before Fosbury captured the imagination of the public and his competitors in Mexico City, there were two other jumping styles.



Ethel Catherwood training at the 1928 Olympics in Amsterdam. Born in North Dakota, she competed for Canada. Catherwood won the gold medal for high jump.





The STRADDLE JUMP is more efficient than the scissor. (All of the jumpers in Mexico City except Fosbury were using this style.) You take off from the inside foot, lift the outside leg, and roll over the bar facedown.



## WHY IT WORKS

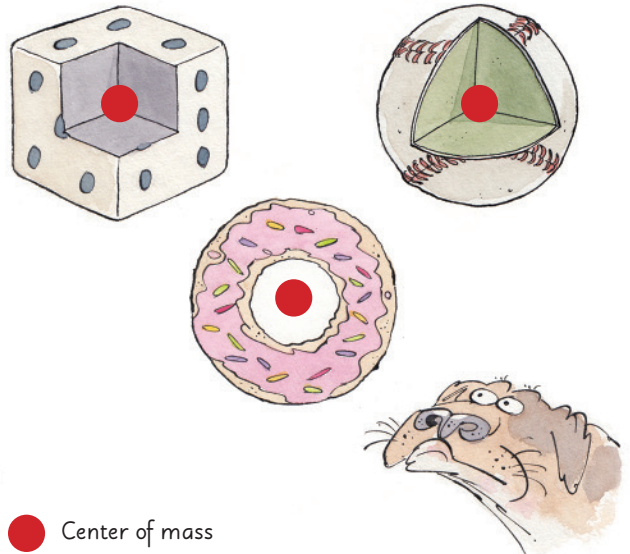
To complete a successful high jump, you have to tackle two problems:

- **get the middle of your body as high off the ground as possible, and**
- **arrange all the dangly bits—those pesky arms and legs!—to work to your advantage.**

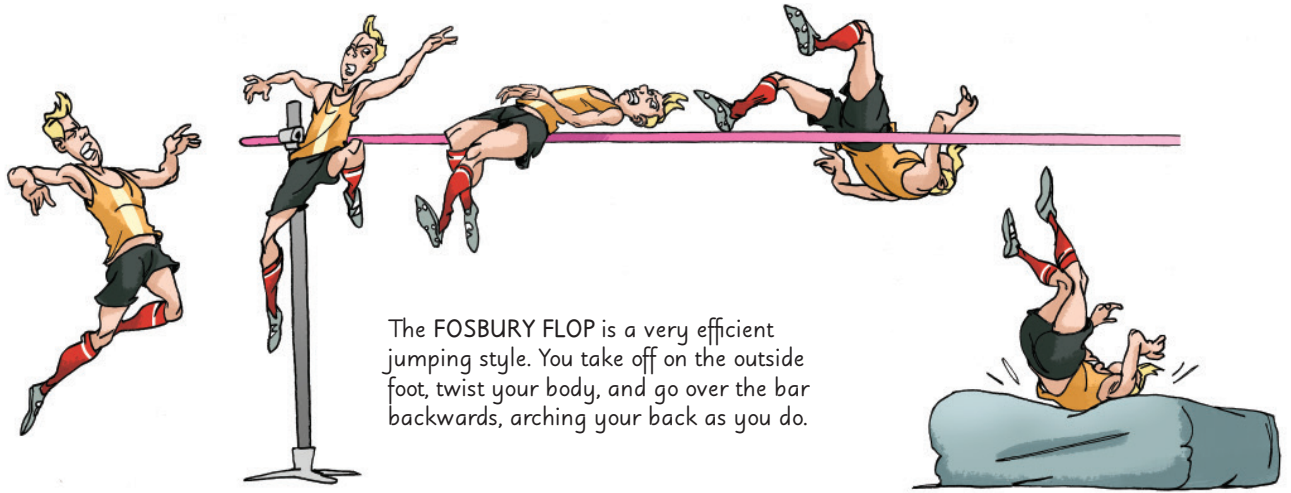
First things first: height. This part is actually simple. When you jump, you just push off as hard as possible (simple, but certainly not easy!).

Understanding the dangly bits? Not so simple. First you have to know about center of mass. That's the scientific name for "middle of your body." Locating an object's center of mass is easy if we're talking about a simple shape (see diagram). With a block or a ball, the center of mass is right smack in

the middle, as you'd expect, but the donut is different. There, the center of mass is located in the hole—not in the actual donut itself.





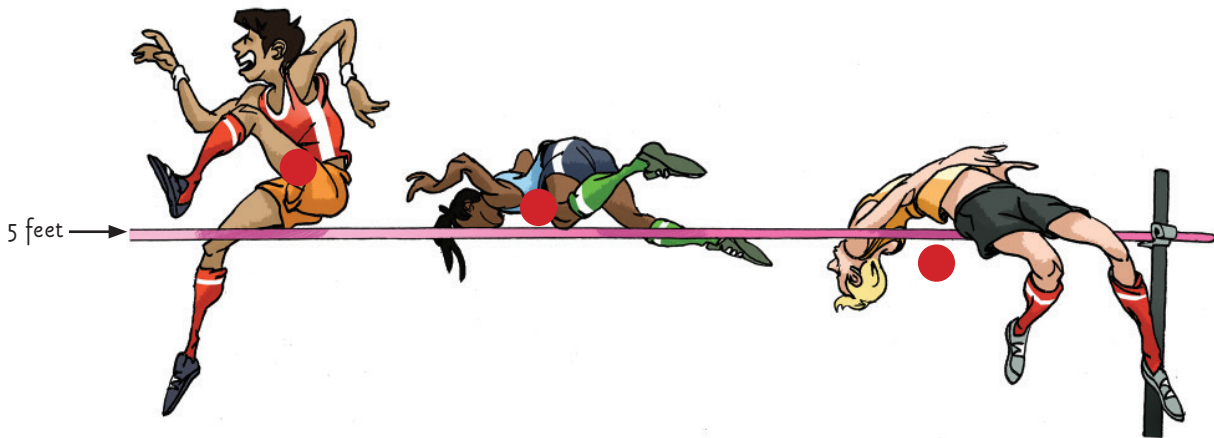


The FOSBURY FLOP is a very efficient jumping style. You take off on the outside foot, twist your body, and go over the bar backwards, arching your back as you do.

Something similar happens with the human body. Your center of mass changes depending on your posture. Stand up straight and your center of mass is in your stomach. Lift your arms and it moves a little. And if you bend over, your center of mass drops and is located outside your body.

So, suppose you jump hard enough to raise your center of mass to a height of five feet. Does that mean you can clear a bar set at that level? Not necessarily. The height you can actually clear depends on how you arrange those dangly bits—in other words, your jumping style.





To clear a 5-foot bar with a SCISSOR JUMP, you have to lift your center of mass quite a lot higher than the bar—maybe 5 feet 6 inches.

For a successful STRADDLE JUMP, your center of mass only needs to be a little higher than the bar—maybe 5 feet 3 inches.

Using the FOSBURY FLOP—the “neatest” jumping style of the three—your center of gravity can actually be lower than the bar, maybe 4 feet 10 inches.

## IF NOT DICK, THEN DEBBIE

During the same years that Fosbury was developing his technique, Canadian high jumper Debbie Brill had independently started using the same technique. At the age of 16, using her “Brill bend” jumping style, Debbie became the first North American woman to clear 6 feet.



Debbie Brill at the 1984 Olympic Games in Los Angeles

Search for “1968 Olympics high jump” to find videos of Dick Fosbury’s jumps.



## INVENTING THE FLOP

How did Fosbury come up with this great idea? By accident. Like many athletes, Fosbury had a hard time with the straddle technique. To do it properly, an athlete's timing and coordination need to be perfect—and Fosbury's weren't. In high school, he could only clear 5 feet 4 inches and was struggling in competitions. Desperate for a way to improve his performance, he asked his coach if he could try the scissor jump in the next competition. And that's when everything changed.

"Using the scissors, I make 5-4," Fosbury explained later. "And I am sitting there looking at the bar at 5-6, trying to figure out, 'Now how can I jump higher?' I know I have to lift my butt up, because that is usually where you knock the bar off. So as I try to lift my hips up, my shoulders go back a little bit, and I clear 5-6. It was kind of a lazy scissors. At 5-8, I lift my hips a little higher, and my

shoulders go back a little further, and I make it. At 5-10, same thing. By this time, I am going over the bar flat on my back. I'm upside down from everyone else, into kind of a back layout. I go out at 6 feet, and nobody knows what the heck I'm doing."

Fosbury kept using the flop, and in his senior year he placed second in the state high-school championship. But his college coach wasn't a fan of the new technique and kept pushing Fosbury to learn the straddle. Finally, when Fosbury could only manage 6 feet 4 inches using the straddle but broke a school record of 6 feet 10 inches using the flop, his coach said, "We're going to develop this thing."

By 1968, Fosbury had done just that—and nobody ever suggested he try the straddle jump again.

## IT'S THE PITS!

Prior to the 1960s, the landing pits for high jump were filled with sand or wood chips. Landing on your shoulders from a height of 7 feet would have been very painful and dangerous. It was only during the 1960s that people started using foam rubber pads, several feet high, in the landing area. So the Fosbury flop wouldn't have been practical—or safe!—until around the time Dick Fosbury invented it.

