



A G.A.T.E.WAYS JOURNEY

for gifted Year 3 and 4 students

with a love of science and sport

'SENSATIONAL SPORT'

...where science and technology meet human performance

G.A.T.E.WAYS is an independent organization offering challenging and enriching activities and experiences to develop and extend highly able children. This *JOURNEY* will run over four sessions. Sport is the biggest spectacle on earth. With large sporting events such as the Olympic and Commonwealth Games, the World Cup and, of course Grand Slam tennis, viewed by millions of people worldwide, there is increasing awareness of the importance of science in sport. Scientists are regularly analysing human performance and the way we interact with technology. This involves a field called biomechanics, which uses mechanical laws to examine causes and effects of human movements and their interaction with external apparatus and equipment, and a side branch of physics called aerodynamics.

Do **you** have an interest in sport? Do you love science and technology? If yes, then this Journey is for you!

The program will break down the complexities of sport science by reviewing the basic physiology of our bodies. We'll look at reflexes, heart rates and the biomechanics of muscle. We'll investigate the dramatic changes in technological innovation using the most familiar equipment, bicycles and balls. Finally, we'll conclude our investigations with the measurement of performance, our own and the champions. When one thousandth of a second is all that separates a Bolt from Gatlin, everything counts. Elite sporting figures featured in the program include Anna Meares, Shane Warne, Cathy Freeman, Thomas Wills, Donald Bradman and Dawn Fraser.

Session 1 The human body is a work of art and a scientific marvel

Our bodies are more magnificent than any machine ever invented. While we may occasionally break down, no machine can diagnose and repair itself like humans. Trained humans can run further than most dogs or horses. Trained humans can swim or paddle across oceans. It is said our strength is in our bones, muscles, tendons, ligaments, lungs and heart, yet some say our true strength is in our attitude. How do we increase that strength? How does exercise make our bones stronger? This session we'll take a close look at the structure of our bones and what happens if a bone is stripped of calcium. We'll discover the features of cartilage and what makes it so strong. We'll make a models of the way muscles work and a model of our lungs, the muscle that helps us breathe 8 million times every year. You'll check your heart rate and marvel at its power and endurance. What can we do to make our heart stronger? We'll also briefly look at the way nerves send signals to the brain and find out what else lies just beneath our skin to help us stay cool. What does research say is the minimum amount of exercise we need to be fit and healthy, and how does this compare with what is needed by athletes to perform at an elite level. This week we will start a personal log of our vital statistics, we assess our strength, our speed of reflexes and our resting heart rate.

This session we'll take a look at one of Australia's incredible rock climbers, Monique Forrester, who brings strength, calmness, flexibility and endurance to some of the scariest climbing videos you will ever see.

Session 2 Four bicycles that changed the world and four more than might

The evolution of the bicycle has been rapid and dramatic. The bicycle has had many spin offs from the biplane to the wheelchair. What do these machines have in common, the bone-shaker, penny farthing, velocipede and the recumbent? This week we discover why the bicycle replaced the horse and how bicycles are responsible for women wearing pants for the first time. On the scientific side we investigate why bicycles are as strong as ants, meaning they can bear many times their own weight. We examine how gears, helmets and aerodynamics can influence an athlete's performance. Why are we safer under most conditions riding faster rather than slowly? In this session we'll also look at the acts of sporting bravery that made Anna Meares an Olympic champion and compare her training and racing regimen with a Tour de France winner.

Week 3 Bending it like Beckham.

Why do so many people spend half their life playing with different-shaped bags of wind? Balls are vital to many sports. Without a ball, sports like tennis, football and golf wouldn't exist! When did people first invent balls and what ball game did Australia's early indigenous population play? What did the early balls look like and what were they made from? We will make a couple of simple balls and improvise a couple more from everyday materials to see if we can create bounce. We'll conduct bounce and spin experiments to find out why a curve ball is the most difficult to catch or hit. We may not be able to bend it like Beckham but we learn how it's done. We'll also marvel at Shane Warne's spinning prowess as he bowled the ball of the century! On the other hand, how did the world's best batsmen, Don Bradman, train his hand-eye coordination. We'll try something similar.

Session 4 Sports Technology changing the way we play sports.

In the 2000 Olympics, Cathy Freeman won the 400 metre track event and brought joy to millions of Australians. This session we round out our investigation of sports science by exploring the way technology can boost performance, or, in the case of Cathy Freeman who wore a full body suit for the first time, boosted the psyche of the performer. What are some of the most important changes in technology? We'll look at shoe development as well as how prosthetics has made it possible for a person without feet to keep up with the world's fastest. In swimming we reached the summit of high tech with the fast-skin swimsuit only to see it banned later because it provided an unfair advantage. We look at the technology available to our greatest Olympic swimmer, Dawn Fraser. What other sports have been transformed by technology? As sporting equipment changes, an individual sport moves in an unexpected direction – we'll specifically look at changes in the pole vault, the javelin and the wheelchair. We'll look at whether we perform better under stress and consider how much stress is beneficial to performance.

Requirements:

Each week bring a hat, pencil, an exercise book, and a nut-free snack. In addition:

Week 1

- a 1.25 litre clean PET bottle with cap.

Week 2

- One large and one small plastic bottle cap (for example: 40mm and 25mm)
- Two clean aluminium cans

Week 3

- A tennis ball, a golf ball, netball or basketball or soccer ball.

Week 4

- A 9v battery

Please note this program has a \$5.00 material levy.

About the Presenter

Tim Byrne has been an avid sports fan since his youngest days at primary school. He has cherished memories of 16 Olympics. A distant relative won the 1956 Olympic men's 1500 metres. Another highlight was when he met Cathy Freeman when she opened the 'Race Cathy Freeman' exhibit at Scienceworks in the late 1990s. The science of sport is a rabbit-hole we have all enjoyed being lost in.

