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# Speed



Written by Bruce D. Cooper

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The fastest living thing, a peregrine falcon

## Introduction

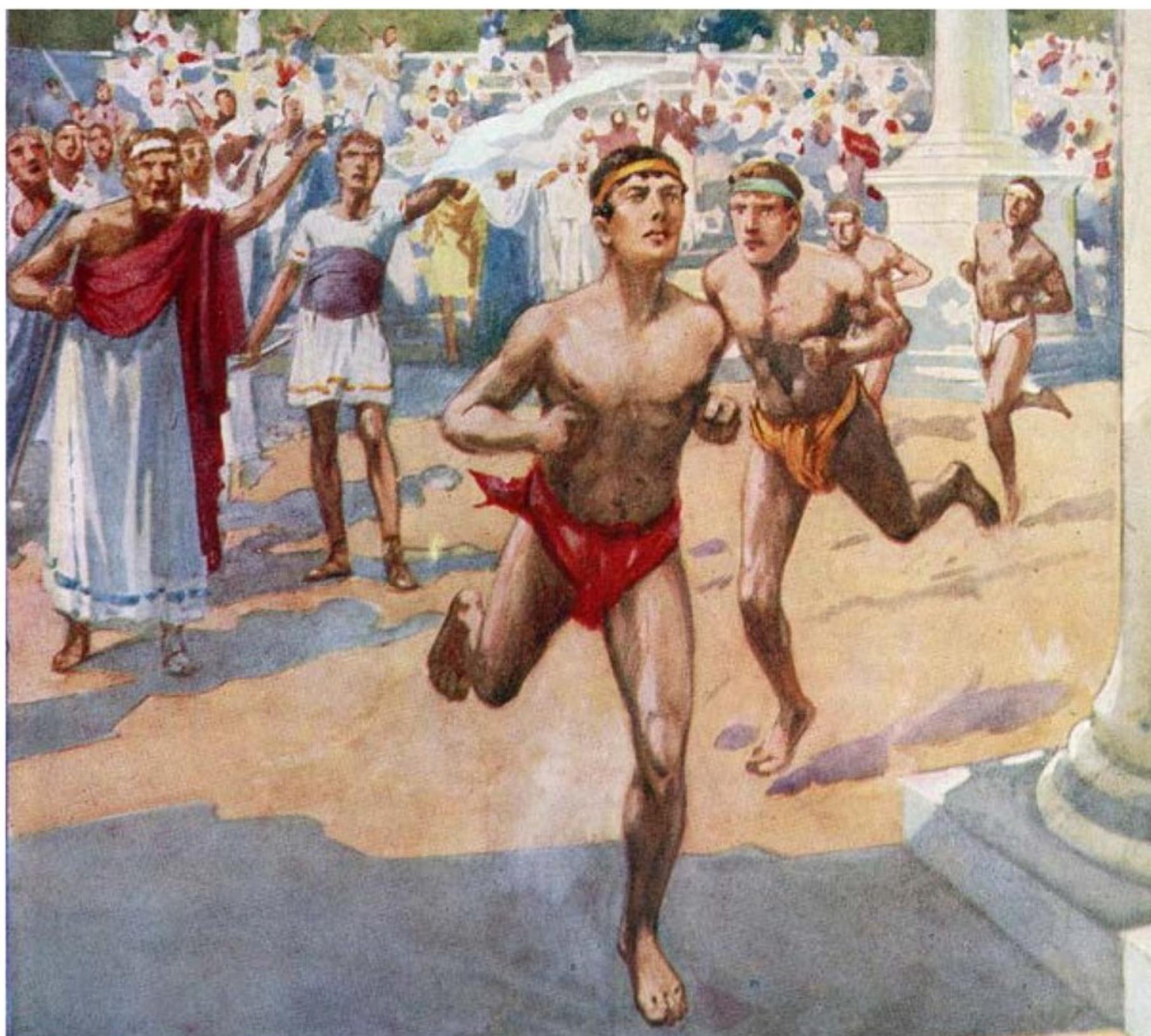
What is speed? Speed is the time it takes to go a certain distance. For most things, speed is measured in kilometers or miles per hour. For example, a speed of 16 kilometers (10 mi) per hour means that something is moving fast enough to travel 16 kilometers in one hour. This speed is recorded as 16 kph (10 mph). Speed can also be measured in other units of time and distance. It can be measured in meters per second or meters per minute. It can be measured in centimeters or inches per second, minute, or hour.

Faster objects are usually measured in larger units of distance and shorter units of time. Slower things, on the other hand, are usually measured in smaller units of distance and larger units of time. For example, a snail's speed might be measured in centimeters per hour. The movement of a glacier might be measured in meters per month. Light—the fastest thing in the universe—moves at 299,338 kilometers per second (186,000 mps).



The marlin (pictured here) and sailfish are among the fastest fish in the world.

People have always seemed to be fascinated by speed. We seem to love things that move fast. It doesn't matter if it is a cheetah chasing a gazelle, a horse galloping around a track, or human runners dashing toward a finish line. We simply think that fast things are cool. Perhaps that is why some of the most popular Olympic events, from the first games on, have been contests involving speed.



Footrace in early Greek Olympic games



Female sprinters competing in the 100-meter dash

## Who Is Fastest?

When we watch a track meet or other sporting event, we cheer for the fastest runners. But compared with other living things, humans are not all that fast. In fact, the fastest humans run at speeds of only about 35.4 kilometers per hour (22 mph).



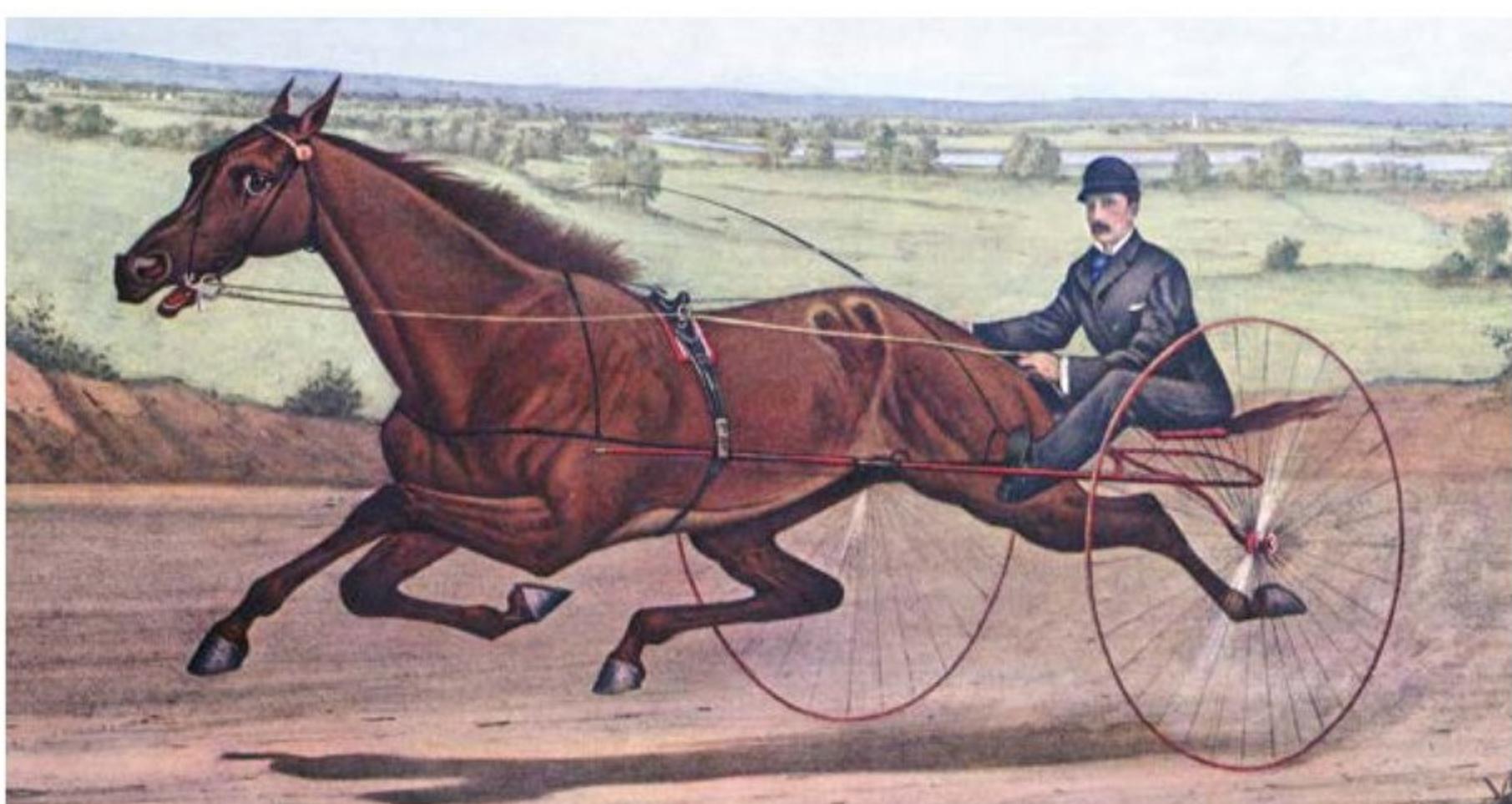
A cheetah runs as fast as a car on the interstate.

Speed is important for the survival of most living things. The cheetah, which runs at speeds of up to 113 kilometers per hour (70 mph), is the fastest living thing on land. The cheetah depends on its speed to capture food. For many animals, survival often depends on being faster than the animal that is chasing you.

Fish swim much faster than humans due to their more streamlined bodies. The fastest fish is the sailfish. It zips through the water at speeds of up to 113 kilometers per hour (70 mph).

The fastest living thing moves through the air. It is the peregrine falcon. This falcon reaches speeds of 435 kilometers per hour (270 mph) as it dives to capture other birds in flight. Even sailfish and cheetahs are slow compared to the falcon.

But humans are not limited by our bodies in order to move from place to place. We use our brains to come up with ways to travel faster. Let's look at some of these ways.



A lithograph of Maud S, the fastest trotter in the world, in 1874



A man riding the "Accelerator," an early bicycle (1819). It could travel uphill at the same speed as a man walking. Downhill it could travel as fast as a galloping horse.

## Bicycles

Humans are the only animals that build mechanical things. We keep inventing new ways to go faster and faster. Long ago we found that by building and riding bicycles, we could go faster than riding a walking or trotting horse. A bicycle didn't take up as much space as a horse. We didn't need to feed and water it, and we didn't have messes to clean up.

When we ride a bicycle, the air in front of us seems to push back. This is called air resistance. As we ride faster, the air seems to push back harder. In 1899, a bicycle racer named Charles Murphy had the idea of reducing air resistance by riding his bicycle behind a train. By riding behind a train, Murphy was able to go 98.5 kilometers per hour (60 mph). The land speed record for bicycles is now 244.6 kilometers per hour (152 mph). This record was set by a bicyclist riding behind a race car.



A bicyclist rides behind a motorcycle to reduce air resistance and go faster.



A ship showing sails puffed up by the wind

## Boats

When humans first started using boats, speed was governed by how fast the river flowed, how quickly and hard we paddled, and how hard the wind blew. By using sails, we were able to go faster than paddling. Because of drag (pull) of the water on the boat, sailors were limited in their speed. As boat designs improved, sailors were able to go faster, but never faster than the speed of the wind and the current.

The invention of the steam engine brought about huge changes in travel. When the steam engine began to be used to power ships, people could go even faster. They were able to go faster than the wind and water. They could travel *into* the wind and against the current of the water.

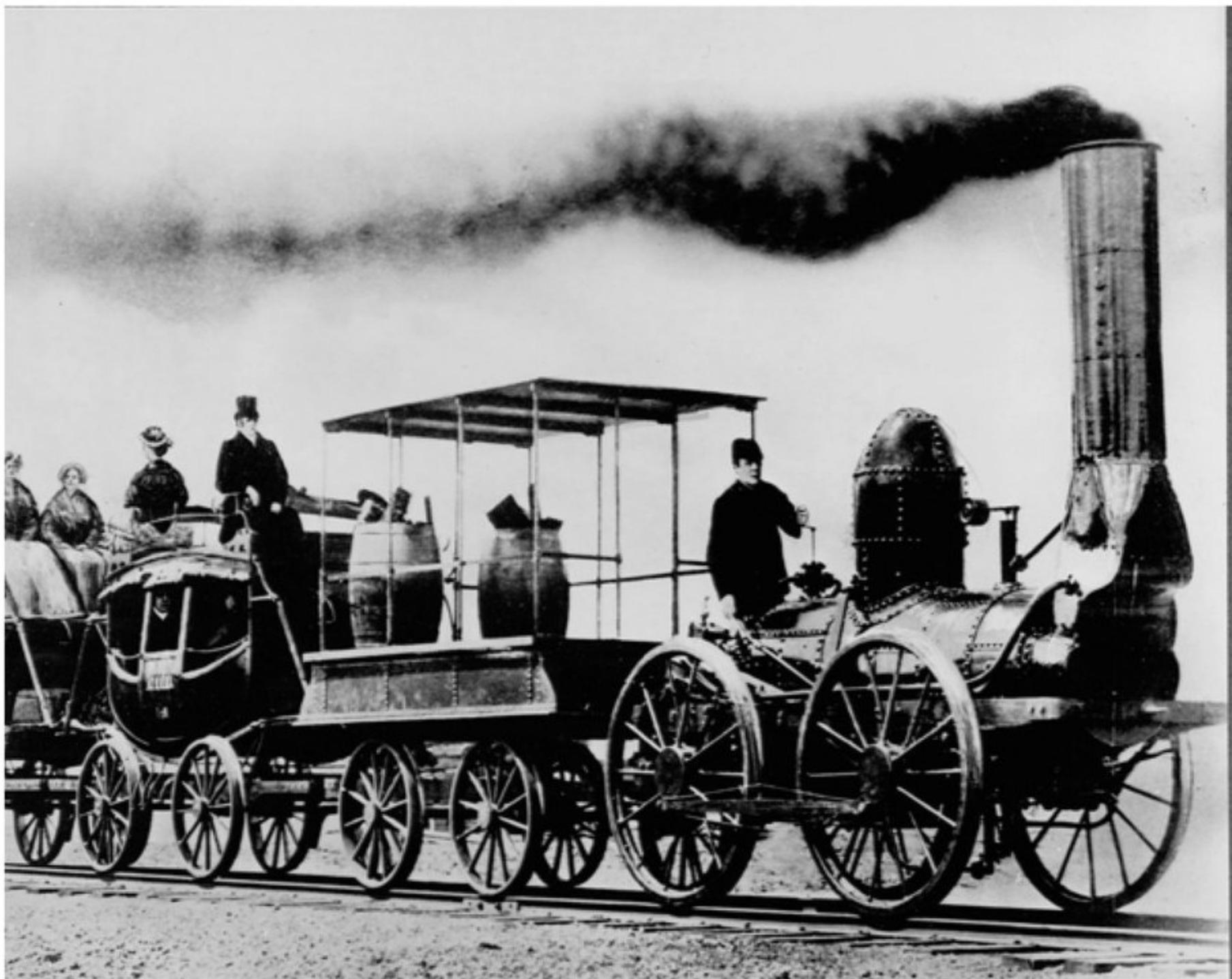


The SS United States, powered by a steam engine, was the fastest ocean liner ever. It crossed the Atlantic Ocean at an average speed of 35 knots (65 kph, or 41 mph). Its top speed was 44 knots (80.5 kph, or 50 mph).

The drag of the water on the bottom of the boat slows it down. Modern racing boats are designed to barely touch the water as they skim over the surface. This is called *hydroplaning*. A hydroplane boat can go as fast as 354 kilometers per hour (220 mph). The fastest boat in the world is a jet-powered hydroplane. It has gone 510.2 kilometers per hour (317 mph).



A hydroplane on the St. Clair River



An early steam locomotive

## Trains

The steam engine was first used to power boats and tractors. When the train was invented, the steam engine was used to power it, too. These trains carried people and products faster than boats or wagons could.

Early trains reached speeds of up to 65 kilometers per hour (40 mph). Some passengers, used to much slower horse-drawn carriages, fainted when traveling at these speeds.

For years, train speed was limited by the train's wheels rolling over steel rails. This problem was solved when magnetic trains were invented. At high speeds, magnetic trains don't even touch the tracks.

Modern trains, called bullet trains, with new powerful engines, now travel at speeds of nearly 320 kilometers per hour (200 mph). There are plans for even faster trains. These trains will travel through tubes at over 800 kilometers per hour (500 mph).



A high-speed train in Japan



An early automobile

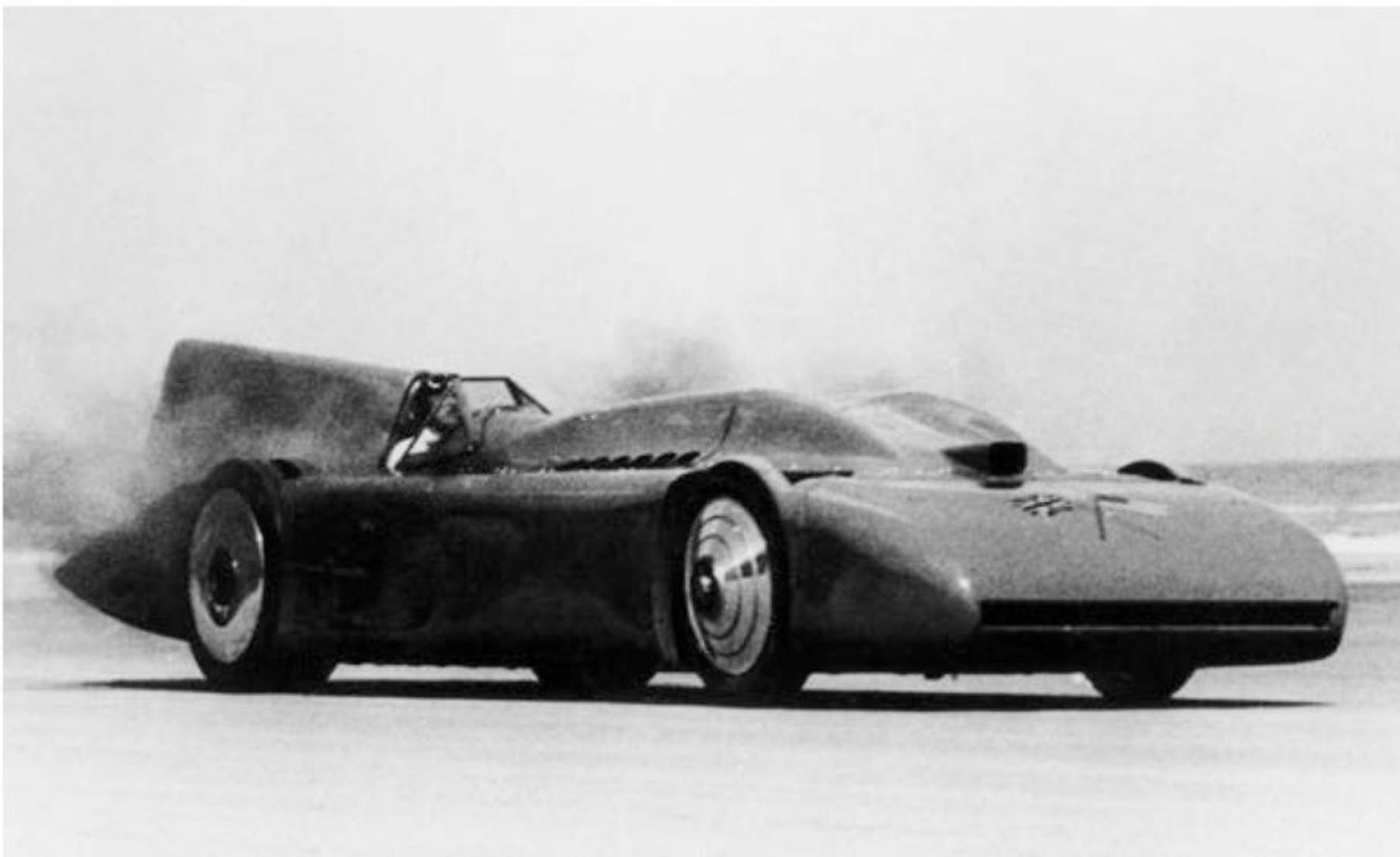
## Automobiles

When automobiles were first invented, they were very slow and fragile. The first car was not much more than a small horse buggy rolling on bicycle wheels, with a small, noisy engine powering it. It was kind of like a golf cart with a lawn mower engine. Can you imagine a golf cart as your family car?

Some early cars also had steam or electric power. The first recognized land-speed record for an automobile was set in 1898. An automobile powered by an electric motor went 63.13 kilometers per hour (39.24 mph). Imagine going down a bumpy dirt road in a golf cart at almost 64.4 kilometers per hour (40 mph). The driver must have had quite a thrilling ride!



An early automobile race, 1900



Sir Malcolm Campbell in one of his Bluebird cars trying to set a new world land speed record on Daytona Beach, Florida, 1934

As engineers, designers, and builders improved cars, the cars went faster and faster. In the early 1900s, there were no paved roads to drive fast on. People found that they could drive on the hard-packed sand on ocean beaches at low tide. For many years, the fastest speed records were set on beaches. People discovered that they also could drive fast on dry lake beds in the desert. Places like the Bonneville Salt Flats in Utah and the Black Rock Desert in Nevada are flat, open areas extending for miles. Vehicles are safely driven at high speeds over these dry lake beds.

The land speed record for wheeled vehicles is held by a jet car that is powered by two jet fighter engines. In October of 1997, Andy Green became the first human to go faster than the speed of sound in a land vehicle. He went 1,228 kilometers per hour (763.035 mph) in a jet car called the *Thrust SSC*. It went from a complete stop to 965.6 kph (600 mph) in 16 seconds.



Andy Green driving his Thrust SSC at 1,228 kph (763 mph)



The Lockheed SR-71 is the fastest jet airplane in the world.

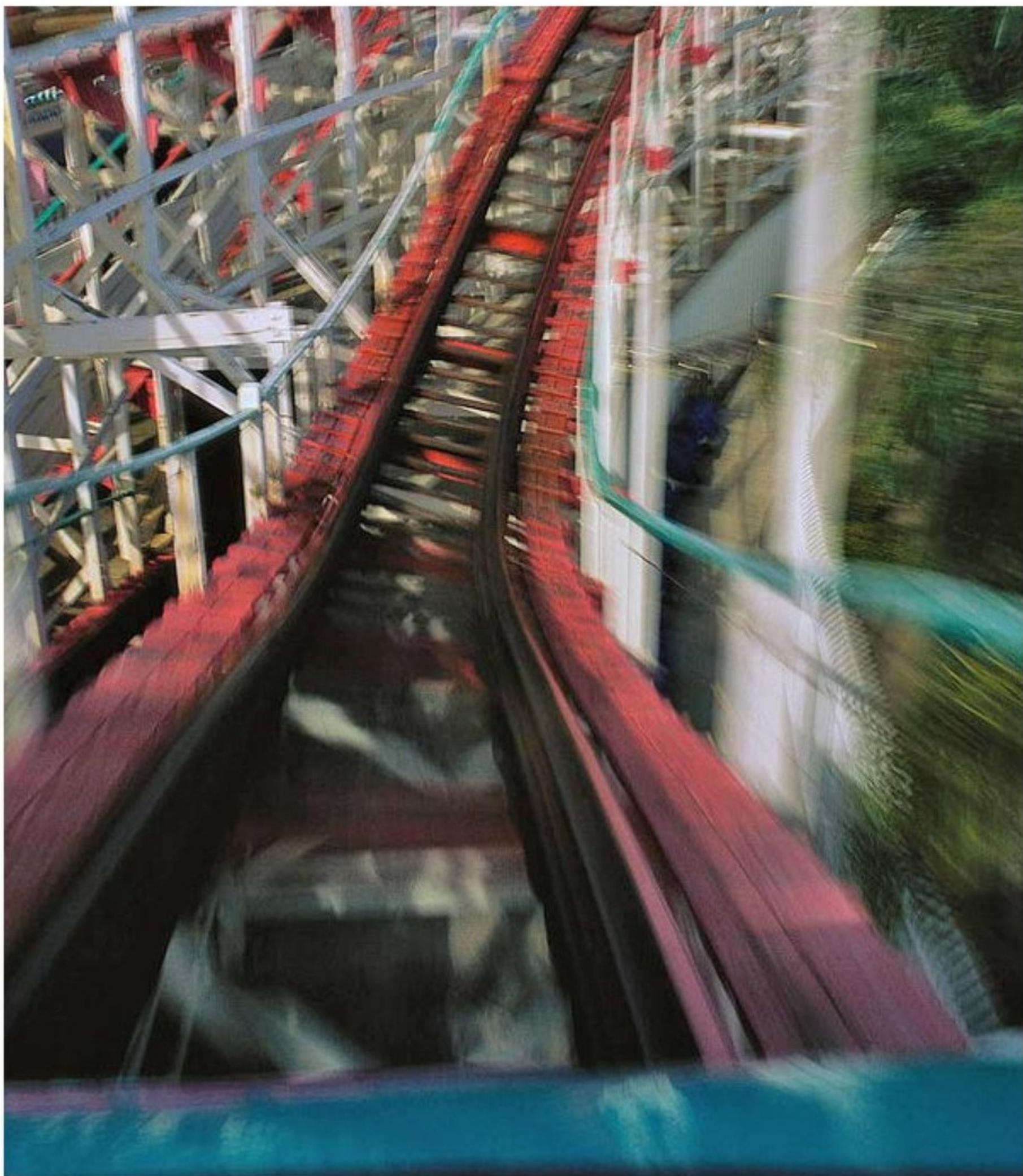
## Aircraft

Humans have always wanted to fly like birds. Over the centuries, inventors have tried many different ways to fly. The first airplanes used engines that drove propellers. About 40 years later, the jet engine was invented, and the speed of aircraft really increased. The speed record now for aircraft is 3,367 kilometers per hour (2,193 mph). Can you imagine flying all the way across the United States in one hour and 15 minutes? An average jet airliner now takes about five and a half hours to make the trip.



The Saturn V launching an Apollo mission to the moon.

If you want to move really fast, become an astronaut. In order to escape the gravitational pull of the earth, rockets must go over 45,062 kilometers per hour (28,000 mph).

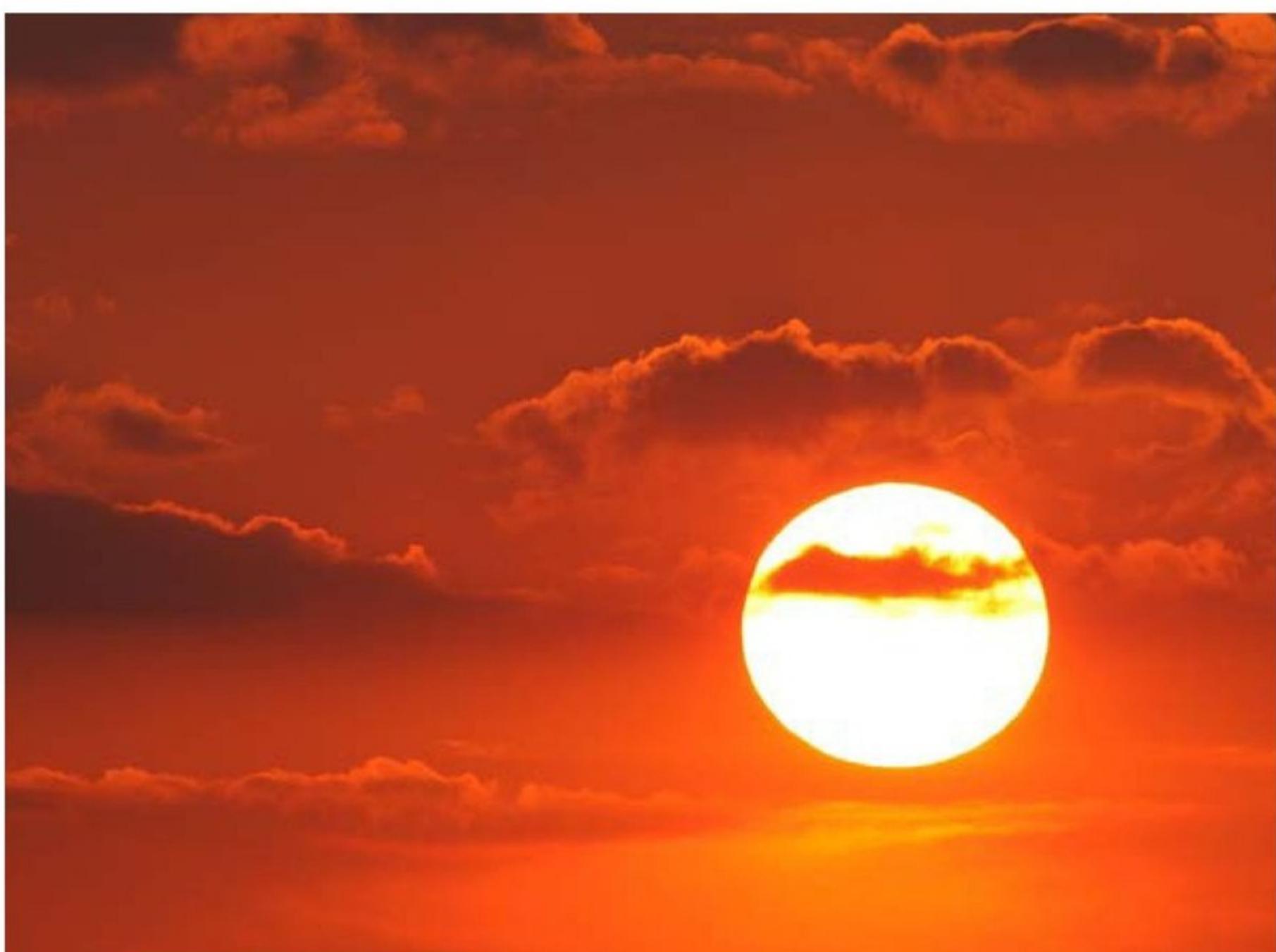


## Conclusion

It is unlikely that, in the future, cheetahs will run faster or sailfish will swim faster. Nor is it likely that falcons will fly faster. Even humans are not likely to run much faster than they do now. But that won't stop humans from finding other ways to go faster.

At one time, humans wanted to travel at the speed of sound. Eventually, we found ways to make planes that traveled faster than sound. Today, rockets blasting off for space travel several times greater than the speed of sound. No doubt, humans will continue to find ways to go faster over land and water and through the air.

Humans probably will not be satisfied until we are traveling at the speed of light. At that speed, we could circle the globe more than seven times in a single second. It is hard to imagine moving at such an incredibly fast speed.



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