



# LIFE AT THE EXTREMES



Susan Rose Simms

A high-altitude mountain landscape with a brown yak in the foreground. The yak is lying down on a rocky, sparsely vegetated slope. In the background, there are large, rugged mountains with patches of snow under a clear blue sky.

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high noon books

# CONTENTS

Extremophiles .....	4
Extreme Heat .....	12
Extreme Cold .....	20
Extreme Heights .....	28
Extreme Depths .....	34
Deep Underground.....	40



# EXTREMOPHILES

There are places on Earth that are very hot or cold. There are places very high in the mountains, deep under water, or deep underground. People can't live there. But plants and animals called **extremophiles** (ex•TREEM•oh•fye•ulls) can.

Extremophiles **adapt** to life in bitter cold or burning hot places. This means they change to survive. Some can live without air, water, or sunlight.

# HIGHEST AND DEEPEST POINTS ON EARTH

## Mount Everest

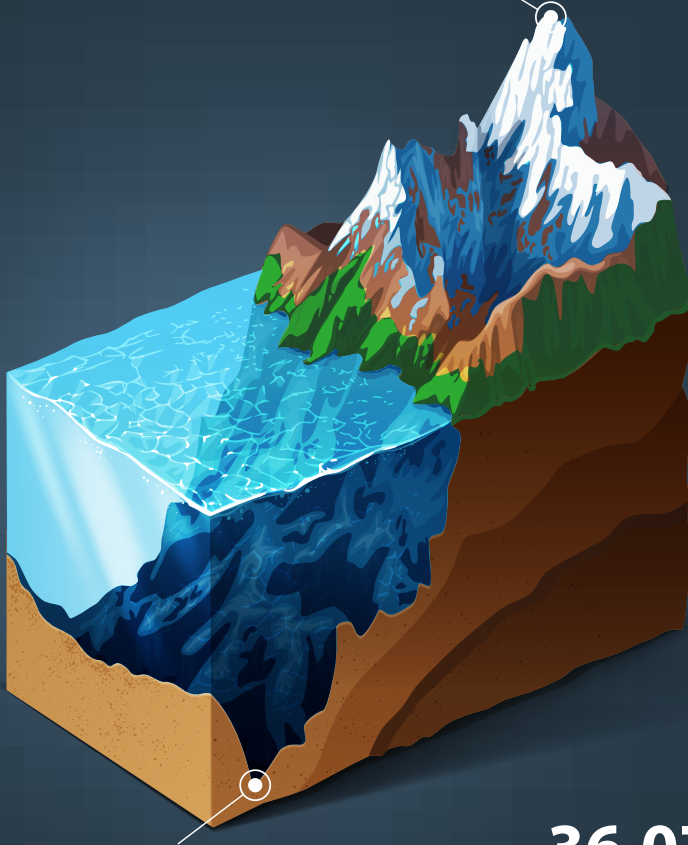
is the world's highest mountain.



Location

China and Nepal

29,029 ft



Sea Level

## Mariana Trench

is the deepest part of the world's oceans.



Location

western Pacific Ocean,  
to the east of the Mariana Islands

36,070 ft

In the Arctic and Antarctica, winters can be as cold as  $-128.6^{\circ}\text{F}$ . There are few or no sunlight hours in winter. Summers are short.

Some plants adapt by growing close to the ground to avoid the wind. Some animals adapt by growing heavy fur.



*Arctic plants have adapted to grow in the cold.*



*The chuckwalla lives mostly in hot, dry areas. It has adapted to be active in the heat. It does not need to drink water to survive.*

In hot, dry areas, animals adapt by storing water in their body fat. Many spend the day underground to avoid the sun's heat. Then they come out at night. Some animals have large ears to release body heat. This helps them keep cool.

Other extreme places include caves, the tops of mountains, and deep water.




*Some kinds of monkfish live deep under the ocean.*





*Many animals that live in caves, like this crayfish, are light-colored. They can't be seen by enemies in a cave's darkness.*

In caves, there is no sunlight, and the air may be hard to breathe. Many mountains are so high that there is less air to breathe. Food can't grow there. In the deep ocean, the **pressure** (PRESH•er), or weight, of the water above can crush living things.

A large, brown, bear-like tardigrade with eight legs, crawling on a rocky surface. The tardigrade is the central focus of the image, appearing much larger than its actual size. It has a plump, segmented body and thick, wrinkled skin. Its legs are short and stout, ending in small claws. The background is a close-up of a grey, textured rock surface.

One animal, the tiny tardigrade (TAR•dih•grayd), can live just about anywhere. Tardigrades are also called water bears. Through a microscope, they look like bears with eight legs.

### EXTREME FACT

Tardigrades can survive very harsh conditions. They dry up into an almost lifeless state. They can survive many years like this. Once they are in water again, they come back to life.



*The tiny tardigrade can live just about anywhere.*

They're the toughest creatures on Earth. They can live without food or water for 120 years. Temperatures above boiling or below zero don't kill them.

# EXTREME HEAT



*Iran's Lut Desert is one of the hottest places on Earth.*

Some places are just too hot for humans, such as Iran's Lut (LOOT) Desert. The world's hottest land temperature, 159.3°F, was recorded there.

An extremophile called Ruppell's fox lives in the Lut Desert. During the day, the fox stays cool in its den. At night, it hunts for food. This keeps its body from losing water.

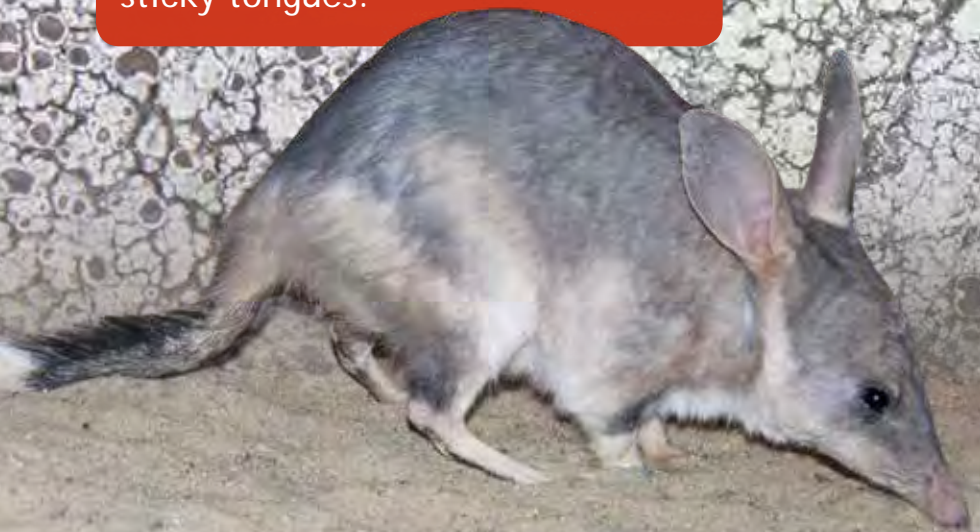


*Ruppell's fox hunts for food at night to stay out of the desert heat.*

An animal called the bilby lives in hot, dry parts of Australia. It builds a deep tunnel to stay cool. Both the bilby and Ruppell's fox have large, bat-like ears. As blood moves through their ears, it gets rid of heat.

### EXTREME FACT

Bilbies don't see very well. They use their large ears and sharp noses to find food. They lick seeds off the ground with their long, sticky tongues.





*The Somali wild ass has adapted to the heat. It doesn't need to drink water very often.*

One of the hottest places on Earth is Ethiopia (ee•thee•OH•pee•uh), in East Africa. The Somali (soh•MAH•lee) wild ass lives here. It has large ears, too. It only needs to drink water once every two or three days.

In the Sahara Desert, in North Africa, there are ants that have silver hairs. The hairs reflect heat, or bounce it away.

The ants move quickly. Their feet don't touch the sand for very long. When it's hot, the ants feed on other insects that have died from the heat.

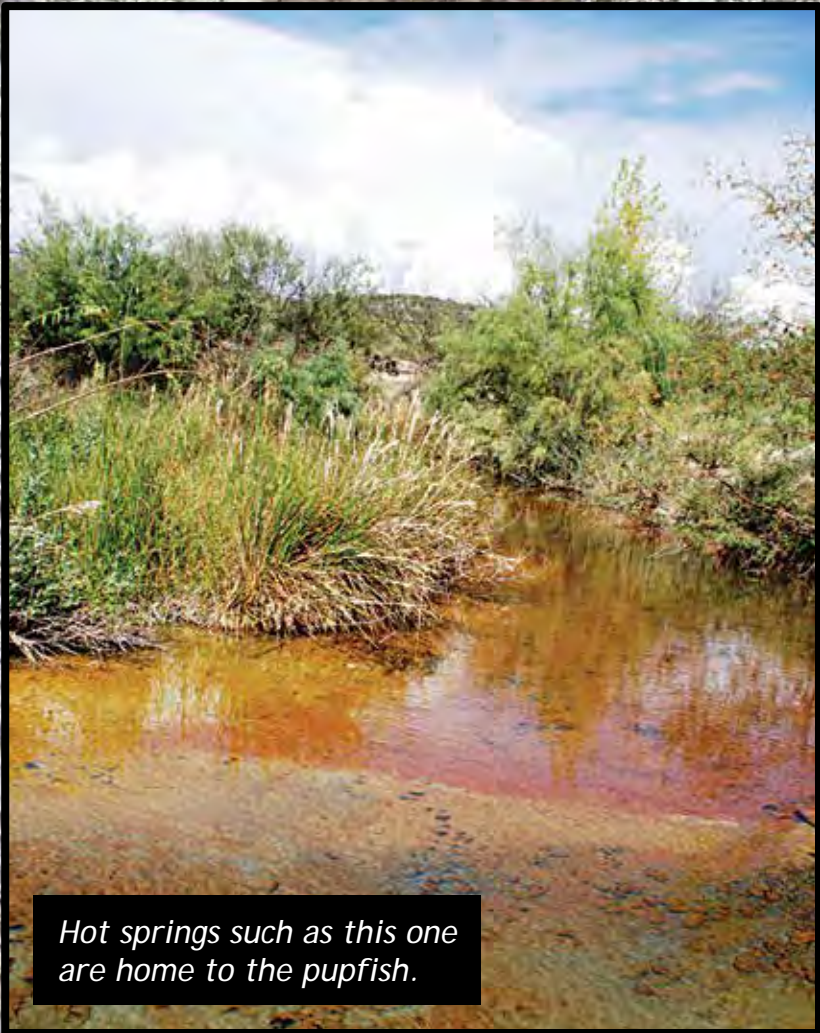






*These ants have silver hairs that reflect the desert's heat.*

In Texas and Mexico's Chihuahuan (chih•WAH•wahn) Desert, there are hot-water springs. Fish called pupfish have adapted to the 100°F water.



*Hot springs such as this one are home to the pupfish.*



*Pupfish can live in water that is more than 100°F.*

These fish can go up to five hours without breathing air. During this time, they make ethanol (ETH•uh•nawl), a form of alcohol. Their bodies break it down to get energy. Scientists (SYE•en•tists) think this is how pupfish survive the heat.

# EXTREME COLD

Glucose (GLOO•kose) is a type of sugar. It gives your body energy. It's also how some extremophiles stay alive in the icy cold.



*The musk-ox has adapted to the cold. It has a thick, warm coat. It uses its hooves to dig in the snow for plants to eat.*



*The Alaskan wood frog freezes in cold weather. It defrosts when it is warm again.*

The Alaskan wood frog makes glucose in its liver. When it's cold, 70 percent of the frog's body freezes.

The glucose makes a thick syrup. It stays inside the frog's cells. This keeps the frog from freezing until it's warm again.

The woolly bear caterpillar makes glycerol (GLISS•er•all). It's an anti-freezing liquid. Hairs cover the caterpillar. They keep heat in.



*The woolly bear caterpillar's hairs hold in heat.*



*Animals that live on the tundra must be able to survive the cold.*

The Arctic tundra is home to small rodents called lemmings. Tundra is land that is flat and cold, with few trees.

Thick hair keeps lemmings warm. They have round bodies, short tails, and tiny ears. The shape and size of these parts cut down on heat loss.



*Lemmings have thick fur to keep them warm.*

## EXTREME FACT

Lemmings grow longer front claws in winter. They use them to dig tunnels under the snow. This protects them from cold and from animals that eat them.



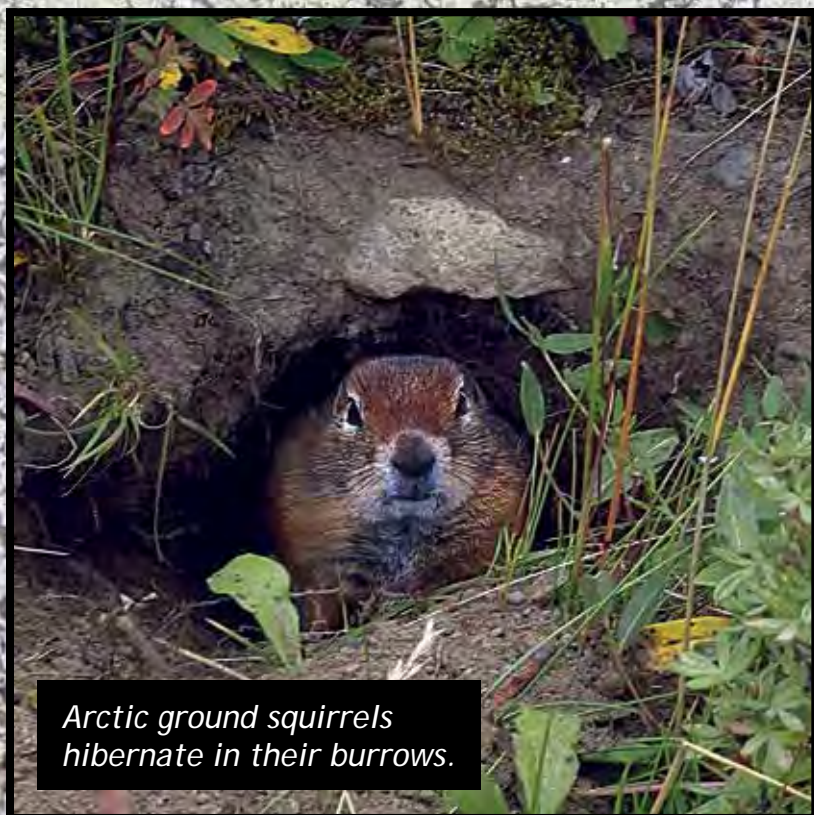


*The Arctic ground squirrel lives farther to the north than any other kind of ground squirrel.*

The Arctic ground squirrel has the lowest body temperature of any mammal. It has a surprising way to warm up.

The squirrel sleeps, or **hibernates** (HYE•ber•nayts), for eight months. Sometimes while it hibernates, it loses heat.

Every two to three weeks, the squirrel starts shaking. Fifteen hours later, it stops shaking. The shaking returns its temperature to normal.



*Arctic ground squirrels hibernate in their burrows.*



*Blubber protects the walrus in ice-cold waters.*

Other animals have body fat to keep them warm. The leopard (LEH•purd) seal, narwhal (NAR•wul), and walrus have **blubber**. Blubber is thick fat. It protects these animals from the cold in freezing waters.