DARWIN

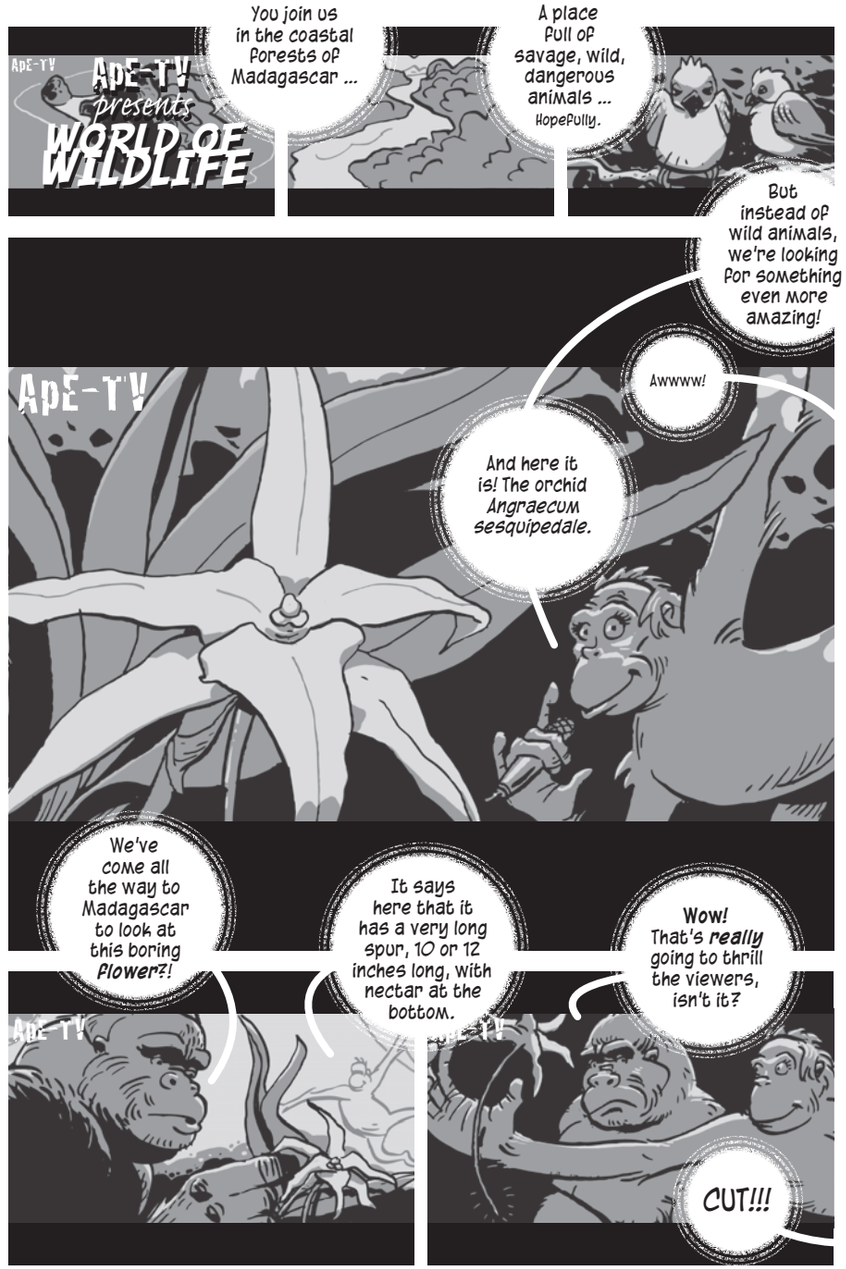
A GRAPHIC BIOGRAPHY

THE REALLY EXCITING
AND DRAMATIC STORY
OF A MAN WHO
MOSTLY STAYED AT HOME
AND
WROTE SOME BOOKS

By EUGENE BYRNE AND SIMON GURR

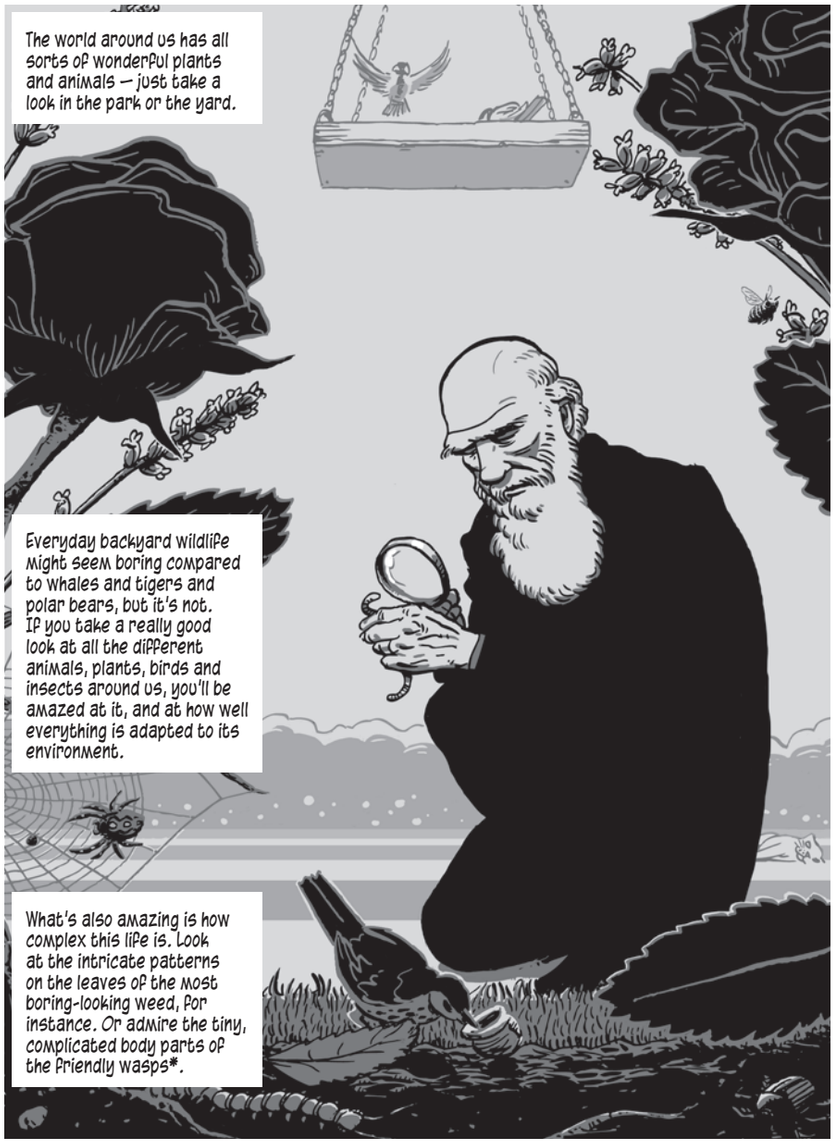
Smithsonian Books

WASHINGTON, DC


APE-TV
APE-TV
presents
WORLD OF WILDLIFE
You join us in the coastal forests of Madagascar ...
A place full of savage, wild, dangerous animals ...
Hopefully.
But instead of wild animals, we're looking for something even more amazing!
APE-TV
Awwww!
And here it is! The orchid Angraecum sesquipedale.
We've come all the way to Madagascar to look at this boring flowerz!
It says here that it has a very long spur, 10 or 12 inches long, with nectar at the bottom.
Wow! That's really going to thrill the viewers, isn't it?
APE-TV
APE-TV
CUT!!!


That was wonderful, darlings! You're both awesome talents! But there was a teensy little problemette with that scene. We need to work on your motivation.
You could start by telling us what's so interesting about this stupid flower.
Well, I think it's pretty. Much nicer than some horrid snake!
CLAP CLAP
Darlings, you're both right — as always! Helen, sweetie, can you tell us why we're filming this boring but pretty flower?
It's all about the long spur with the nectar in it.
When he first saw one of these orchids, Charles Darwin said there must be an insect with a proboscis over 10 inches long that would feed from it.


Pro-what's-iss?
A proboscis — an organ that lots of insects have for feeding and sucking. Think of it as a long tongue and nose all mixed up.
Ewwww! That's disgusting!
Cool!
You know, for TV wildlife program presenters, you two don't know very much.
We don't have to know much. Viewers love us for our good looks, charm and charisma.
Yeah! What he said!
Darwin said there must be a moth with a very long proboscis that it would stick into the orchid's spur to drink its nectar. Pollen from the plant would rub off on the moth's head, which in turn would be rubbed off on the next orchid it visited, thus fertilizing it so that new ones would grow.
An insect with a nose-tongue thingy 10 inches long?! That's ridiculous! I can't say that on TV. The viewers will think I'm stupid!
No comment.
And it has this 10-inch proboscis? I don't believe you! Even if it's a big moth, the proboscis would be several times as long as the moth's own body!
That would be like me having a tongue 23 feet long!
SLURP! SLURP!
The moth with the long proboscis that Darwin said must exist wasn't actually observed until many years after he died. It's a moth called *Xanthopan morganii praedicta*. The *praedicta* is Latin for "predicted," because Darwin predicted it!



* This is a joke. Wasps aren't friendly. If you bother a wasp it'll sting you.
** Yes, we know that you know that wasps can sting. But the Health & Safety people said we had to warn you anyway.
*** Also, we might get sued. Like if some kid is stung after reading this, his or her parents might try to sue us for a million dollars for the time they had to spend kissing it better.
**** That's parents kissing the sting better. Not kissing the wasp better. Obviously.
***** Don't kiss wasps. Seriously. Just don't.

Two hundred years ago, almost everyone believed that all this life was so clever and complicated that it could not have just "happened." It was put there; all those millions of different types of animals and plants were created by a god or gods.

Nearly every society in the world through the whole of history has had a "creation myth," a story or set of stories about how the world and everything in it were created.

The Christian (and Jewish) creation myth is in Genesis, the first book of the Bible.

And God said, "Let there be light," and there was light.

According to Genesis, God created everything over six days. On the sixth day he created man — Adam.

He later made Adam a companion called Eve, and the two of them lived happily in a wonderful place called the Garden of Eden until they ate the fruit of the Tree of Knowledge of Good and Evil.

He condemned Adam and Eve and their descendants (that's us) to a hard life of pain and struggle.

This angered God, who threw them out of the garden.

Since Roman times, the Christian church taught that everything in the Bible really had happened.

But as the centuries passed, questions were raised about how true some of the Old Testament — the part of the Bible about the time before Jesus was born — really is.

For instance, the astronomers Nicolaus Copernicus (1473-1543) and Galileo Galilei (1564-1642) had shown that the Earth revolves around the sun. But the Bible says the Earth does not move, and the Catholic Church actually forced Galileo to say he was wrong.

It does move, you know.

What did you say!?

Nothing.

The church eventually had to admit that Galileo was right.

The Protestant and Catholic churches in Europe and America were equally strong in their defense of Genesis. God had created all the animals, birds, fish, insects, trees and plants of the world, and EVERYTHING had been the same ever since the day he had made them.

In Britain they even thought they knew exactly when God had created the Earth. The date had been worked out in the 1640s by Bishop James Ussher.

He began the Creation at six o'clock on the evening of Saturday October 22, 4004 BC.

Nowadays we know the Earth is much, much older — about 4.54 billion years — and most people think Ussher is laughable. To be fair, he was a brilliant scholar who made his calculation using ancient historical writings as well as the Bible. He does not deserve to be ridiculed for a mistake based on the best knowledge people had at the time.

But by the late 1700s, more and more "naturalists" — people who studied nature — were starting to question the truth of Genesis and to question the church teaching that nothing on Earth had ever changed.

Anyone who studied nature could see that landscapes and environments had changed over time — and so had the animals living in them.

What about earthquakes, for instance? These often changed the landscapes they affected. Or volcanoes?

And what about fossils? Fossils appeared to be the remains of plants and creatures that had existed thousands, or even millions of years ago. Many of these were of creatures that clearly did not exist anymore.

The church had a couple of responses to this:

Fossils are the remains of the animals which did not manage to get onto Noah's Ark during the Great Flood, which you can read about in Genesis.

God has placed fossils in the rocks for decoration!

Besides, people had been "selectively breeding" plants and animals for thousands of years to improve crops to yield more food, or to resist bad weather and disease. People bred stronger, faster horses, or cattle that produced more milk, or sheep with better wool, or pigs with more meat ...

A good example of selective breeding is the dog. Wild dogs were first domesticated by man thousands of years ago for jobs like hunting, herding animals, guarding farm animals from predators and so on. Nowadays we talk about different "breeds" of dog because that's exactly what they are — they have been bred over the years for different roles. Males and females with desirable traits, such as strength, speed, aggression or intelligence, are mated with each other to breed new generations that are stronger, faster, or more aggressive or intelligent.

Arrr ... I'm trying to breed a dog that'll herd the sheep and can fill in my tax forms.

We're not quite there yet.

And, of course, if you go to a dog show, you'll see all sorts of weird and wonderful animals — many of them have been specially bred as show dogs.

So not all plants and animals were the same as they had always been, because new ones were being made all the time through selective breeding.

And if human beings could change living things over the years, why couldn't nature do it as well?

By 1800 even a few church leaders wondered if Genesis was literally true. But even if it wasn't, few people doubted that God had designed the world and everything in it.

Anyone questioning Genesis had to deal with the "watchmaker argument."

This idea was most famously put forward by a churchman named William Paley (1743-1805), whose books were hugely popular.

Imagine you are walking through the countryside and find a watch lying on the ground.

You pick it up and examine it and see that it's made of various materials — glass, and different types of metal. You open it up and see that it contains a complicated mechanism of springs, cogs and gears.

You wouldn't think the watch had just "happened," would you?

You would know that this intricate piece of machinery has been designed and made by an intelligent being.

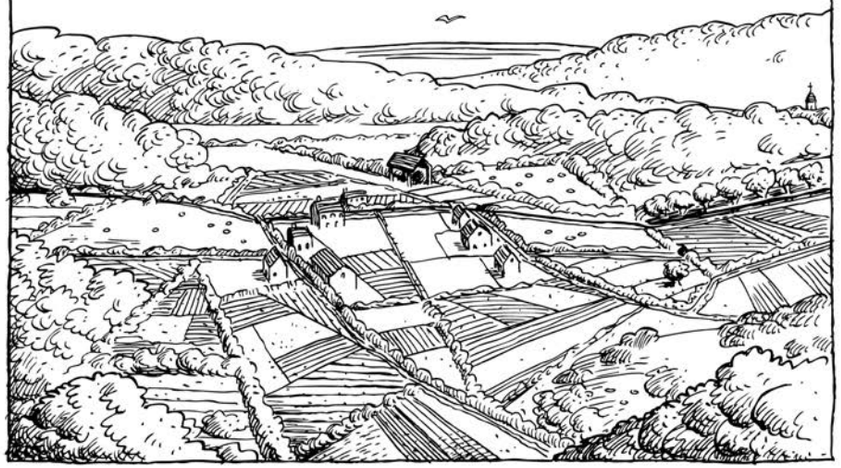
Well, it's the same with animals. Look at how wonderfully complicated the internal organs of a human being or animal are. Look at how well all the plants and animals fit into their environments.

All life, and the whole universe — the sun, moon and stars — are all so complex and work so perfectly that they MUST have been made by a designer.

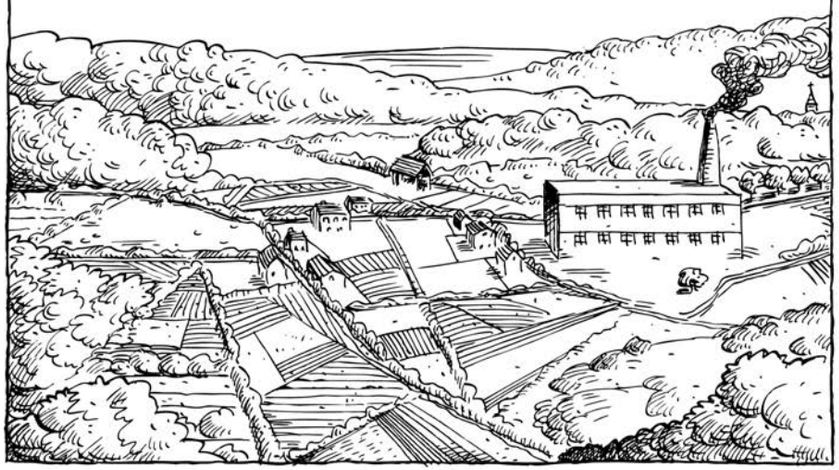
And that designer is, of course, God.

When Charles Darwin was born in 1809, most people lived in small towns or villages. Ideas, information and news did not spread quickly. Travel was expensive and difficult as there were no decent roads, and a journey of even 10 miles was a big adventure.

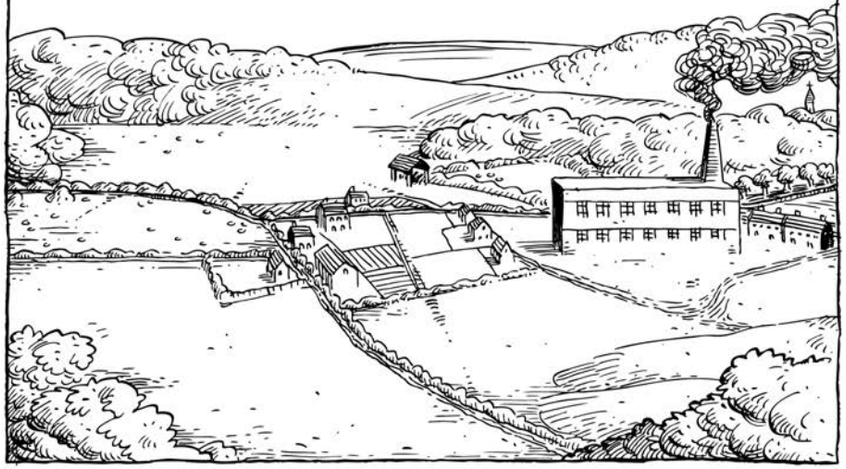
This started to change with the industrial revolution.



"Industrial revolution" is the term for a number of changes in farming, manufacturing and transportation in the 1700s and 1800s that had a huge effect on the way people lived. Improvements in mining and metallurgy (the science of metals) and the development of steam engines meant that simple, repetitive work that had once been done by human hands was now done by machines. Factories were built to make everything from cloth to pottery, to buttons and belt buckles cheaply and in large quantities.



Farmers and landowners came up with more efficient methods of farming – and improved crops and livestock through selective breeding. Now there was more food available and fewer people needed to work on the land. They could work in factories and workshops instead.



Canals were built so that food, goods and raw materials could be transported quickly and cheaply by barge. Roads, which had just been dusty (or muddy) dirt tracks, were improved so that horse-drawn carts and carriages could travel more smoothly.

The industrial revolution created the modern world; one in which we mostly live in towns and cities and work in factories, shops and offices for a wage instead of working on the land, growing our own food.

The industrial revolution was based on knowledge — on advances in science, technology and understanding of the natural world.

Developments in science, engineering and invention came from careful observation and measurement. One particular man is a very good example of the way in which the industrial revolution, business and the rise of science come together — Erasmus Darwin.

Erasmus Darwin (1731-1802) was born in Nottinghamshire, England, educated at Chesterfield Grammar School and Cambridge University. He went on to study at Edinburgh Medical School and set himself up as a doctor in Lichfield in Staffordshire. He was very successful.

Erasmus Darwin was also a naturalist, philosopher, inventor and poet. He married twice and had lots of children.

Erasmus Darwin was fascinated by new knowledge and was one of the founders of the famous Lunar Society. This was a group of scientists, inventors, businessmen and thinkers who met every month during the full moon (so that they could see their way home again at night — there was no street lighting in those days).

At one time or another, the "lunatics," as they jokingly called themselves, included many of the most important figures in the industrial revolution.

There was the Birmingham industrialist Matthew Boulton,

and his business partner the engineer James Watt (inventor of an improved steam engine),

the scientist and political thinker Joseph Priestley (who discovered oxygen),

the engineer John Smeaton,

the painter Joseph Wright and many others.

The brilliant American scientist and writer Benjamin Franklin visited them when he came to England,

and the great French chemist Antoine Lavoisier regularly wrote to them.

They discussed new ideas and the latest breakthroughs in science and technology. This wasn't just for fun — it could also help them make money. Darwin himself invested in new transportation or industrial schemes and was responsible for a number of inventions, including a type of windmill and a tiny artificial bird. Among his notebooks there are also plans for a rocket engine that was never made, but which is similar to modern liquid-fueled rockets.

Erasmus Darwin also wrote books and poems about his studies of nature. In his book *Zoönomia* he put forward a theory of evolution, that is, he said that plants and animals do change and develop over time. He suggested that all life on Earth came from a single original organism or cause. His long poem "The Temple of Nature" expanded the idea:

First forms minute, unseen by spheric glass,
Move on the mud, or pierce the watery mass;
These, as successive generations bloom,
New powers acquire, and larger limbs assume;
Whence countless groups of vegetation spring,
And breathing realms of fin, and feet, and wing.

So Erasmus Darwin said that life on Earth hadn't been put there as fully formed plants and animals by God. He was saying that plants and animals had evolved over the centuries, having started out as microscopic life-forms.