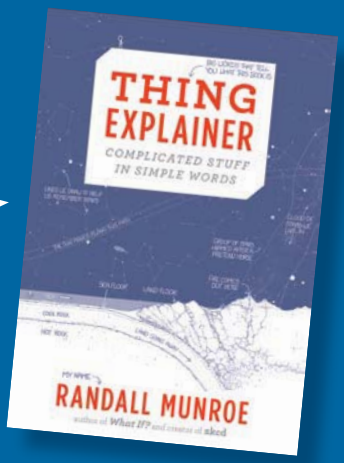
THING EXPLAINER BY RANDALL MUNROE

A BOOK EXPLAINING COMPLEX IDEAS USING ONLY THE 1,000 MOST COMMON WORDS



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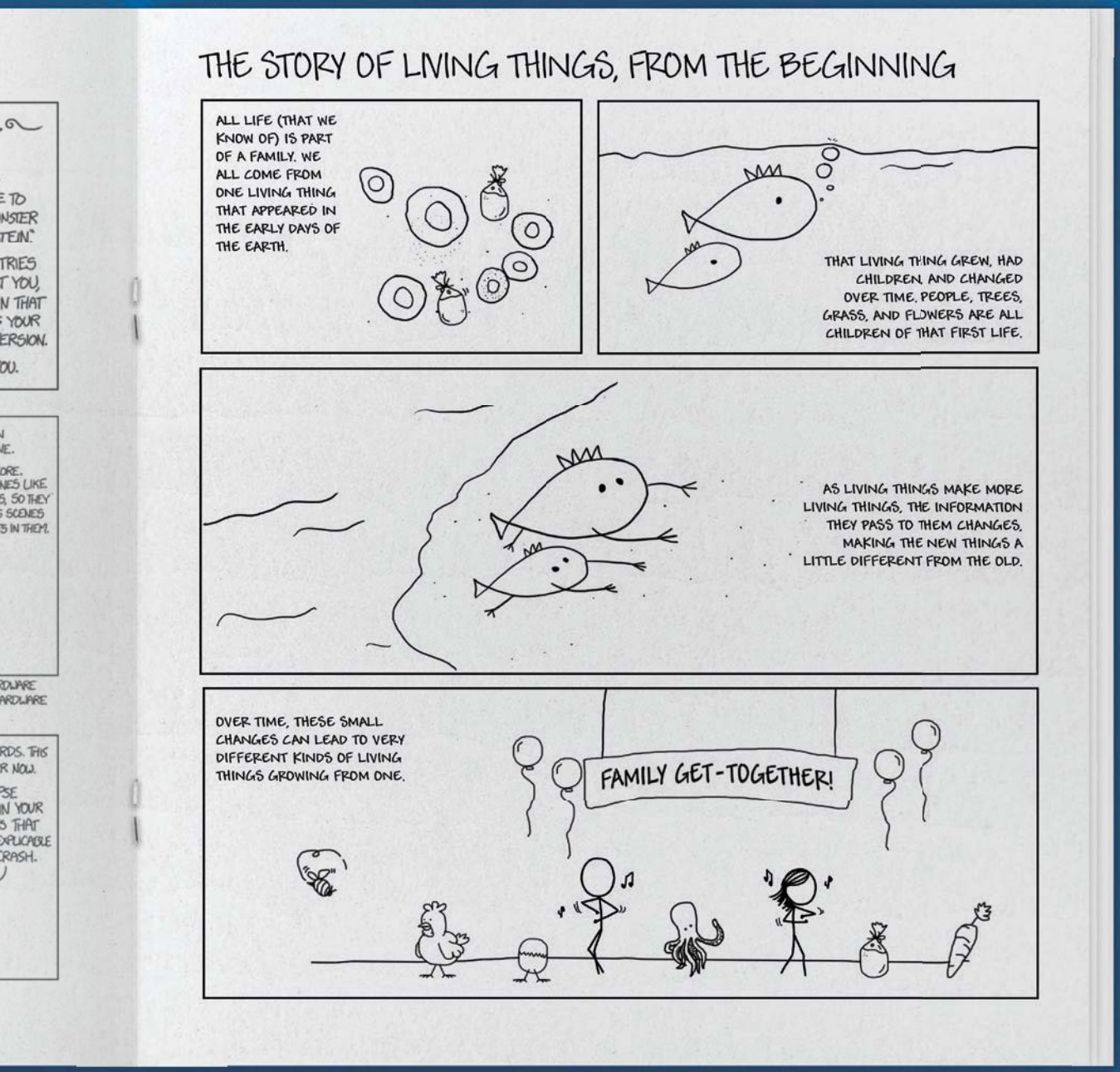
TREE OF LIFE

All living things as part of the same family

You've learned that organisms can be classified based on physical and genetic characteristics, which reveal their evolutionary relationships. Tree diagrams are used to describe the relationships between organisms, both living and extinct. Here's one that uses easy-to-understand language.



This tree shows how different kinds of life branched off from one another.

This tree doesn't show all living things, or even most of them. It just shows some of the living things you might know, along with which branch of life's family they're in.

This is just a tiny part of the tree of life. The whole tree is too big to fit in any single picture, and there are too many kinds of life for anyone to give names to all of them—no matter what kind of words they use.

And really, a true tree of life wouldn't just have a line for every *kind* of life. It would have a line for each living thing that ever was, every one of them crossing and joining and winding across the page, slowly changing from one kind of life to another, in a path that reaches all the way back, without a single break, to that very first life.

No one really knows how many living things there are in the world, but we can make some guesses, and they're big. Not only can we never find enough words to talk about all those lives, we have a hard time talking about the number itself.

Here's one way to think about how many things have lived on Earth: The world is covered in seas that are ringed with beaches of sand. One day, when you're walking on a beach, pick up some sand and look at it. Imagine that every tiny piece of sand under your feet is a whole world of its own, each one with its own seas and beaches, just like Earth.

The full tree of life has as many living things as there are bits of sand on all those beaches on all those tiny sand worlds put together.

Next to the world we're talking about, all our words are small.

ANIMAL THAT LIVES DEEP IN THE SEA AND HAS BEEN ON EARTH FOR A VERY LONG TIME

TREE OF LIFE

WHAT THIS TREE IS GOOD FOR

You can use the tree to tell how much one creature is like another by following their paths. An animal whose path broke off from ours earlier is different from us in more ways than one whose path broke off later, like how an aunt or uncle is different in more ways than a brother or sister.

Sometimes, these families can be a little surprising. Birds and humans are closer to one another than we are to the fish we keep in our houses, which makes sense. But those fish are closer to humans than to the big bitey fish that sometimes eat people, which is strange!

THE START

This is the start of all known life. Here, pieces that send information from parents to children somehow ended up together in a bag of water, and the bag started making more of itself.

We don't know exactly how that happened; that's one of the biggest questions humans are working on answering.

???

We're still figuring out exactly which things came together here and when.

TWO GROUPS

Early on, life broke into two big branches. The things in both branches were made of single bags of water and were pretty simple.

The things in these branches look a lot like each other—it took us a while to figure out that they were from such different parts of life's family tree.

FIRST GROUP (Tiny living things)

THIRD GROUP (Big living things, and some tiny ones, too)

SECOND GROUP (Tiny living things)

GROWING THINGS

This group is made of growing things like trees and flowers. Most of them are green.

STRANGE GROWING THINGS

These look like tiny trees, but are closer to animals than trees. Some of them are good on food, but some can make you sick.

- PLATE WASHERS
- CLEAR SEA BAGS
- LAND BUILDERS

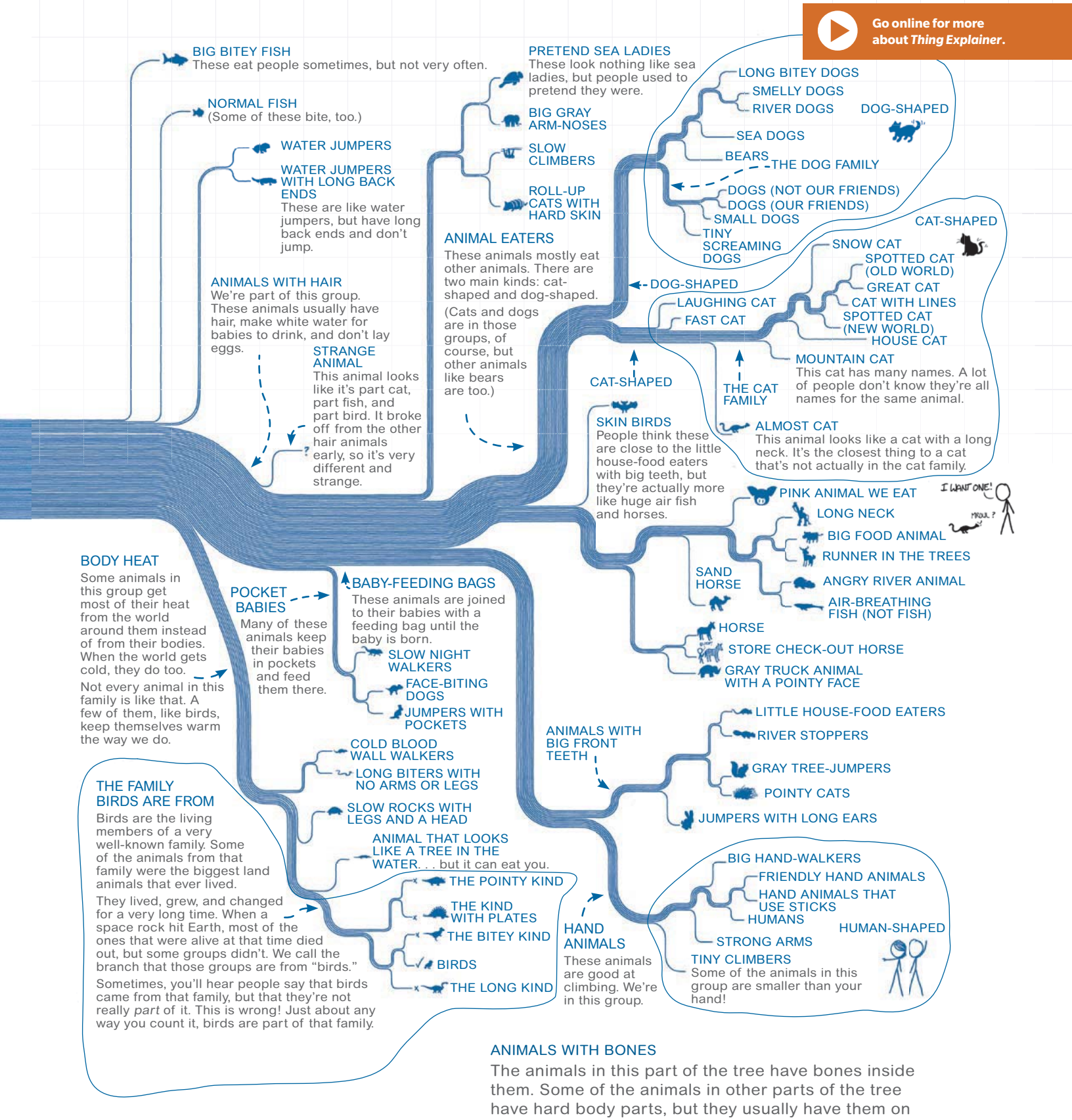
HOW THE THIRD GROUP STARTED

At some point, probably when the Earth was about half as old as it is now, some of those bags ate other bags, and the eaten bags started living inside them.

Those new living things, made from the two groups put together, formed a third group. After a while, the little living things in that group started sticking together to make bigger living things. All living things made from more than one bag of water—like trees, flies, and humans—come from this group.

The other two groups are still around, and in many ways they're much bigger than our group. The creatures in those groups are very small, but there are so many different kinds of them that no one has come close to counting them all. They live everywhere, from seas to the air to inside our bodies and our food. Some of them are even found far below the land's surface, where they live by eating rocks and metal. (Until we found those, we didn't know living things could do that.)

- BIG BRAINS WITH LOTS OF ARMS (WRITING WATER ANIMALS)
- STOMACHS WITH HOUSES
- FLAT STONES THAT BREATHE WATER
- BITERS WITH EIGHT LEGS
- FAST FLYING STICKS
  - HOUSE FLIES
  - DANCING PAPER COLOR FLIES
- LUCKY RED ANIMALS
- HILL MAKERS
- YELLOW-AND-BLACK FLOWER HELPERS
- FLIES WITH POINTY BURNING ENDS
  This is a big group of animals from several parts of the tree.
- ANIMALS WITH CUTTING HANDS
- LITTLE ANIMALS
  This is a very big group of very small animals.
- GRASS JUMPERS
- WATER BEARS
- HOUSE EATERS
  These like to eat the wood under houses, which can make them fall down.
- ANIMALS
- STUFF YOU WON'T FIND ON A ROLLING STONE
- ROUND FOOD
  which shares its name with a round bird
- LIGHT DRINK THAT WAKES YOU UP
- LITTLE ROUND BLUE THINGS
- DARK DRINK THAT WAKES YOU UP
- SOFT RED GARDEN FOOD
- BROWN ROCK FOOD
  This food looks like a brown rock, but is white inside.
- COOL-SHAPED LEAVES
- THINGS WITH FLOWERS
- TREE THAT STOPS HEAD PAIN
- CRYING TREE
- JUMPS
  (flowers used to make beer)
- TIRE TREE
- SWEET THINGS
  This group has a lot of the sweet round colorful things we eat.
- TINY TREES
- SMALL FOOD THEY SAY BIG GRAY ANIMALS LIKE FOOD OFTEN IN CANS
- CLOTHES
- THE STUFF IN DARK SWEETS
- TREES WITH SWEET BLOOD
- YELLOWS AND YELLOW-REDS
- PRETTY FLOWERS
- FOOD FIXERS
- FOOD THAT MAKES YOU CRY WHEN YOU CUT IT
- BENT YELLOW FOOD
- IF YOU GET THIS FOOD WET AND THEN HEAT IT (IN AIR) WHILE STILL IN ITS LEAVES, IT TASTES REALLY GOOD.
- SWEET POINTY FOOD
- BEACH TREES
- YELLOW FOOD WRAPPED IN LEAVES
- SWEET STICK GRASS
- WHITE FOOD
- GOLD FOOD GRASS
- FAST-GROWING STICK GRASS
- YARD GRASS
- OLD TREES
- TREES THAT KEEP THEIR POINTY LEAVES IN WINTER
- FLOWERS THAT EAT TREES



ANIMALS WITH BONES

The animals in this part of the tree have bones inside them. Some of the animals in other parts of the tree have hard body parts, but they usually have them on the outside. The animals in this part have bones on the inside, with the soft parts hanging from them.