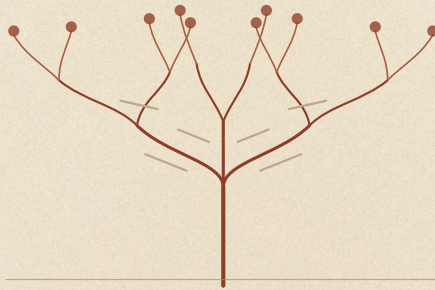


MY OWN READING OF DARWIN · IN EIGHT PARTS

ON THE ORIGIN OF SPECIES

By Means of Natural Selection

Charles Darwin, 1859 — first edition



PART THREE OF EIGHT

The Engine

Chapter IV: Natural Selection

— the whole part, one chapter —

*“...daily and hourly scrutinising, throughout the world,
every variation, even the slightest; rejecting that which
is bad, preserving and adding up all that is good.”*

Darwin, Chapter IV

READ AND EXPLAINED BY LOVEPREET SINGH

I read the whole book myself. This is what I understood,
written the way I'd explain it to a friend.

I

Everything so far, in four lines

This is the chapter the whole book exists for. Before we open it, here is the argument with nothing else attached to it.

Three parts of groundwork are now finished, and each one on its own is dull enough that you could nod along without noticing what you'd agreed to. Here they are together.

THE WHOLE THEORY, STATED AS A SUM

1. Far more individuals are born than can possibly survive. (Chapter 3)
2. No two individuals are identical. (Chapters 1 and 2)
3. Some of those differences make a creature even slightly better at getting through.
4. Offspring resemble their parents. (Chapter 1)

Therefore: the helpful differences get commoner every single generation, and the unhelpful ones get rarer. Nobody has to choose. Nobody has to be watching. It happens the way water finds the low ground.

That's natural selection. That's the whole thing. If you accepted the first four lines, you have already accepted the conclusion — there is no extra step where you have to decide to believe something.

I think this is why the book was so hard to argue with and so easy to hate. It isn't a story about how life came to be. It's a piece of arithmetic that happens to be about animals.

Why this chapter gets a whole part

Because Darwin packs an enormous amount into it, and because three of the ideas in here are the ones people most often get wrong.

- What natural selection *is* — and, more importantly, what it isn't.
- Sexual selection, a second engine running on a different fuel, which explains peacocks.
- Divergence of character — the idea Darwin was proudest of, and the answer to “why are there so many kinds of things?”
- The one and only diagram in the entire book, which he asks you to stare at for about ten pages.
- The Tree of Life, which is where the book quietly stops being about pigeons.

Read this one slowly. It's the only chapter I went back to the start of.

SECTION TWO · CHAPTER IV OF THE BOOK

II

What natural selection actually is

And, because almost everybody gets this wrong, a longer list of what it is not.

Darwin gives his definition plainly, and it is much smaller and more boring than the phrase has become.

THE DEFINITION

“This preservation of favourable variations and the rejection of injurious variations, I call Natural Selection.”

WHAT HE MEANS — Helpful differences get kept because their owners live to breed. Harmful ones get thrown out because their owners don't. I've given that a name.

Read it again and notice how little it claims. There is no force in that sentence. No plan, no direction, no purpose, no chooser. It is a *name for a result*, not a thing that does anything.

The word “selection” is a bad word, and Darwin knew it

“Selection” implies a selector. Somebody standing there picking. And Darwin picked the word deliberately, because his whole Chapter I strategy was to make you comfortable with pigeon breeders first.

It cost him. Critics immediately complained that he was smuggling a designer in through the back door, and in later editions he had to add a paragraph apologising for the phrase and insisting he meant nothing of the kind.

MY TAKE — THE SIEVE

The way I finally got it straight in my head: natural selection is a sieve.

A sieve doesn't choose anything. It has no opinion about gravel. It just has holes of a certain size, and if you pour a mixture through it, what's on top and what's underneath ends up sorted — not because the sieve decided, but because that's what holes do.

Now imagine the mixture is pouring through continuously, for a hundred million years, and the sieve is the entire world — every predator, every cold night, every dry summer, every rival. That's it. That's the engine.

Five things natural selection cannot do

This list is worth more than the definition, because nearly every bad argument about evolution — on both sides — is somebody assuming one of these.

1. It cannot plan ahead. It cannot produce a change now because that change will be useful in a million years. Every single step has to pay for itself immediately, in this generation, or it doesn't survive to be built on.
2. It cannot act for the good of another species. Darwin says this flatly, and he means it as a test: if anyone ever found a structure in one animal that existed purely for the benefit of a different animal, his theory would be finished. Nobody has.
3. It cannot make anything perfect. Only good enough — and only good enough *compared to the neighbours*. A slow animal in a place with slower predators is doing fine.
4. It cannot see anything it cannot reach. It works from whatever variation happens to exist right now. It has no access to better designs that would need a redesign to get to.
5. It cannot want anything. Nothing is trying. The wolf is not trying to become faster. Individual wolves are just being born slightly different and mostly dying.

Point three is the one I'd tattoo somewhere. There's no such thing as well-adapted in general — only well-adapted *to here, to now, to this weather, to these rivals*. Change any of those and yesterday's winner is today's casualty.

III

Nature versus the pigeon breeder

Darwin spends Chapter 1 making you respect what a human breeder can do, then spends this section explaining that the human is hopeless by comparison.

Having built his whole case on the analogy with breeding, Darwin now turns round and takes the analogy apart — not because it was wrong, but because it badly undersells what nature is capable of.

MAN'S SELECTION	NATURE'S SELECTION
Can only pick traits he can see from the outside. He cannot breed for a better liver.	Acts on every organ, every internal process, the whole machinery of life — including everything invisible.
Selects for what he wants. Fatter meat, prettier feathers, whatever's in fashion.	Selects for what helps the creature itself get through, right here.
Is careless and distracted. Loses interest, changes his mind, stops for decades.	Never stops. Never gets bored. Never looks away.
Has had a few thousand years with most domestic animals.	Has had hundreds of millions of years, without a break.
Judges by eye, badly, and only notices obvious differences.	Registers differences too small for any human to detect, because they show up as slightly more surviving children.
Same machine. One of them is running at a scale we can't picture.	

The one about invisible traits is the sharpest. A breeder cannot select for a stronger heart, because he can't inspect the heart of a living animal he intends to breed from. Nature has no such problem: a weaker heart shows up as an animal that dies before breeding, and that is all the inspection required.

Then comes the sentence that people have been quoting ever since.

THE MOST FAMOUS PASSAGE IN THE CHAPTER

“It may be said that natural selection is daily and hourly scrutinising, throughout the world, every variation, even the slightest; rejecting that which is bad, preserving and adding up all that is good; silently and insensibly working, whenever and wherever opportunity offers, at the improvement of each organic being.”

WHAT HE MEANS — Every hour, everywhere on earth, every tiny difference is being tested. The bad ones get thrown away, the good ones get kept and stacked on top of each other. It makes no noise and leaves no trace you could watch.

“Silently and insensibly” is the phrase doing the heavy lifting. *Insensibly* means below the level anyone could sense — too slow and too small to perceive, not too small to matter.

And Darwin follows it immediately by pointing out that this is exactly why nobody had noticed. We see nothing of these changes as they happen; we only see, when we dig into the rocks, that the forms of life were once different from what they are now.

A CAUTION ABOUT THAT PASSAGE

It’s gorgeous writing and it is slightly misleading, which Darwin half knew — in later editions he inserted the word *metaphorically* into that sentence to calm everyone down.

Nothing scrutinises. There is no eye. What is really happening is that creatures with worse variations leave fewer descendants, which produces exactly the same outcome as if something had been inspecting them.

Darwin reached for a metaphor because the literal version — “differential reproductive success accumulates over generations” — is true, correct, and impossible to feel.

SECTION FOUR

IV

The second engine: sexual selection

Darwin gives this a few pages here and later gave it an entire book. It is the reason peacocks exist, and peacocks were a genuine problem for him.

Here’s an awkward fact for a theory built on survival. A peacock’s tail is enormous, heavy, brightly coloured and impossible to run away with. Everything about it is bad for staying alive. Darwin admitted the sight of one made him feel sick.

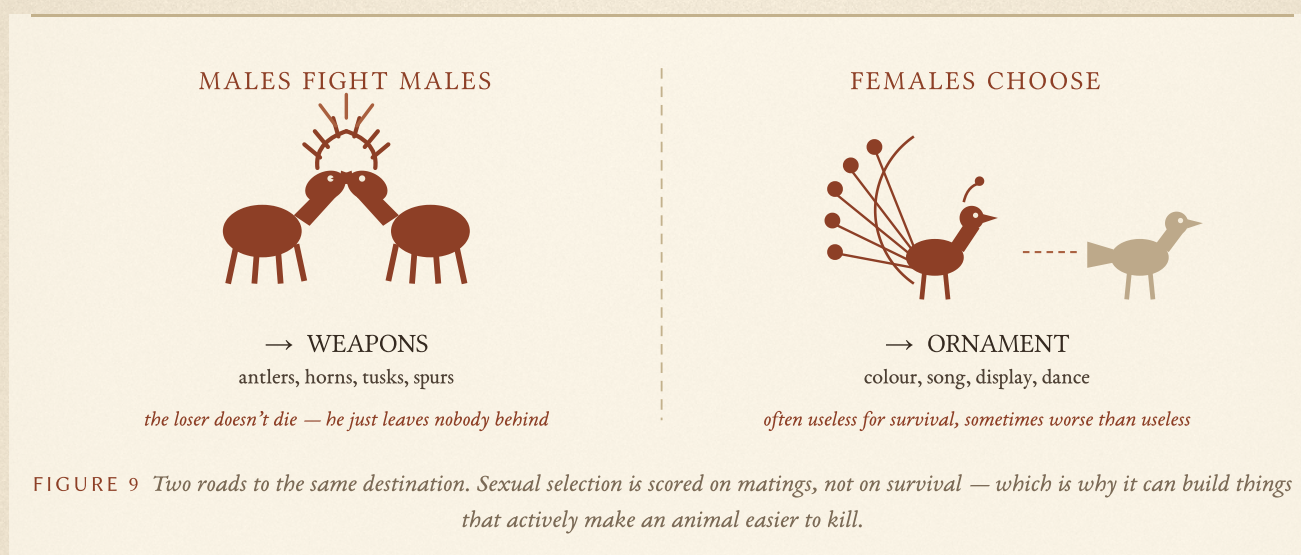
So he introduces a second process, running on completely different fuel.

IN DARWIN'S OWN WORDS

“This depends, not on a struggle for existence, but on a struggle between the males for possession of the females; the result is not death to the unsuccessful competitor, but few or no offspring.”

WHAT HE MEANS — This isn't about staying alive. It's about getting a mate. And losing doesn't kill you — it just means you have no children, which as far as the scoreboard is concerned is the same thing.

That last clause is the key, and it links straight back to Part Two. Remember the scoreboard: descendants, not years. A male who lives a long, safe, celibate life is as thoroughly wiped from the record as one eaten at six months old. So anything that gets you mated can be worth paying for in survival — up to a point.



Once you have this, the awkward cases stop being awkward. A peacock's tail is a real cost, paid in speed and visibility, and it is worth paying because the peacocks with the poorer tails leave no chicks at all. The tail grows until the survival cost and the mating benefit balance out, and then it stops.

Darwin only sketches this here. Twelve years later he gave it a two-volume book of its own, and it's where he finally said out loud the thing he had carefully avoided saying in 1859 — that humans are in this too.

V

One worked example: the wolf

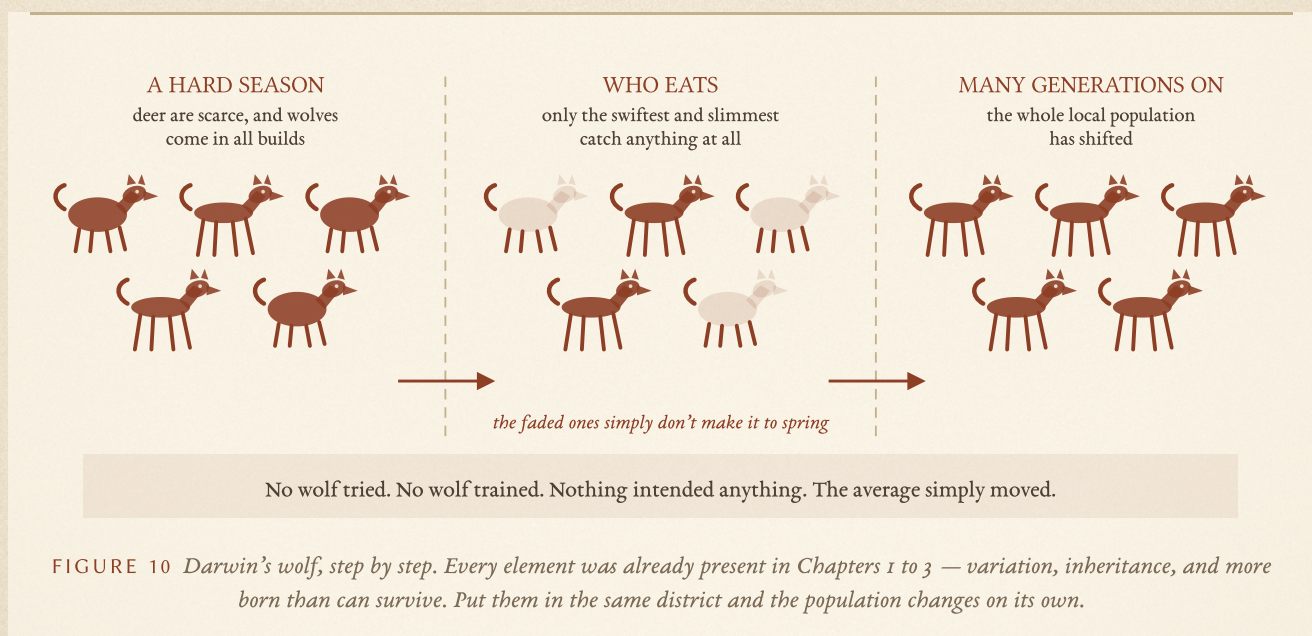
Darwin knew the argument was abstract, so he does one case slowly, from start to finish. It's the clearest thing in the chapter.

Take a district where wolves hunt deer, and the deer are fast. Nothing unusual about it. Now let a hard season come in — prey gets scarce, the way prey does.

The wolves in that district are not identical. Some are heavier, some leaner, some longer in the leg. That variation was always there and never mattered much.

Now it matters. When food is short, the wolves that manage to catch anything at all are the swiftest and slimmest. Those are the ones that make it to spring. Those are the ones that breed. And their pups tend to be swift and slim, because pups resemble parents.

Do that for a few hundred hard seasons and the wolves in that district are visibly faster and leaner than the wolves next door.



Notice what is *not* in that story. No wolf strained to run faster. No wolf passed on the results of its training. Nothing was trying to improve. Individual wolves were simply born a bit different from each other and most of them died.

Darwin then adds a detail that turns out to be the seed of the next section. In the same district, he says, you might end up with two wolf varieties — a light, fast one that chases deer in the uplands, and a heavier one that

takes sheep down in the valleys. One starting population, two ways of making a living, two directions of travel.

That's not one species improving. That's one species *splitting*. And splitting is what the rest of the chapter is about.

SECTION SIX

VI

Divergence of Character

The idea Darwin was proudest of, and the answer to a question the theory badly needed to answer: why is there more than one kind of thing?

Here is the hole. If natural selection keeps the best-fitted, why hasn't it just produced one supremely well-fitted creature that beat everything else? Why is the world full of millions of different kinds instead of a few perfect ones?

Darwin's answer is the cleverest thing in the book, and it took him years to work out. He called it divergence of character.

The reason being different pays

Go back to the line from Chapter 3: the struggle is fiercest between the most similar. Two wolves that hunt the same deer in the same valley at the same time of year are in each other's way constantly.

So imagine a wolf born slightly odd — a bit heavier, inclined to take slower prey down in the valley instead of chasing deer. In a straight contest for deer it would lose. But it isn't in that contest. It has stepped sideways, out of the crush, into a way of making a living that nobody else is fighting over.

That is an enormous advantage, and it goes to *whichever* direction the oddity happens to point. The extremes prosper. And the poor animals in the middle — not quite fast enough for deer, not quite strong enough for sheep — are competing with both sides at once and losing to both.

SO THE MIDDLE GETS SQUEEZED OUT

Generation after generation, the two extremes do better than the average. The average shrinks. Eventually there is no middle left — just two groups that no longer interbreed much, drifting further apart because every step apart is rewarded.

One species has become two. Not because anything split it. Because the space in the middle stopped paying.

The grass plot

Darwin backs this with a real experiment that I love for how humble it is.

Sow a plot of ground with a single species of grass. Sow an identical plot with several distinct kinds of grasses from different genera. The mixed plot produces more plants and a greater weight of dry matter than the single-species plot.

Why? Because the different kinds root at different depths, want light at different times, use slightly different things. They aren't all reaching for the same resource, so more of the available resource actually gets used. The more different they are, the more total life the same square metre can support.

Darwin's phrase for what the diversified descendants are doing is that they become better able to seize on many and widely diversified places in the economy of nature. Every new way of making a living is another slot, and the slot is only there if you're different enough to fill it.

And the same idea explains extinction

This part is grim and it matters for what comes later in the book.

When an improved variety appears, who does it wipe out first? Not distant creatures — they were never in the fight. It wipes out the forms most like itself: its own parent form, and the intermediate varieties between itself and its relatives.

Improvement and extinction are the same event seen from two sides. Something gets better at making a living, and the things it was closest to stop making one.

MY TAKE — THIS QUIETLY ANSWERS THE BIGGEST OBJECTION TO THE BOOK

The obvious complaint about evolution, then and now, is: *if everything shades into everything else, where are all the in-between creatures?* Why are there clear gaps between a cat and a dog?

Divergence answers it. The in-between forms are precisely the ones that got destroyed first, because they were sitting between two winners and competing with both. The gaps aren't evidence against the process. They are the wreckage the process leaves.

Darwin spends whole chapters later defending this. It starts here, in one paragraph, and it's easy to read straight past.

VII

The only picture in the book

One diagram, in five hundred pages. Darwin asks the reader to hold it in mind for about ten pages of dense text, and most people give up. Here it is, redrawn, with the instructions first.

Darwin drew exactly one illustration for the whole of *On the Origin of Species*. It is a page of branching lines and lettered labels, printed on a fold-out sheet, and it is genuinely hard to read — partly because he refers to it across ten pages of argument, and partly because the original is cramped.

It repays the effort, because it is the entire theory in one picture. Read the instructions first, then look.

HOW TO READ IT

Bottom row — eleven species (A to L) that all belong to one large genus in one country. They're spaced by how similar they are: neighbours are close relatives.

Upwards is time. Each horizontal line is a thousand generations or more. The whole diagram covers fourteen of them.

A line that forks is a variety splitting off. A line that stops is extinction — that lineage is finished.

A and I are the common, widespread, successful species. They throw off the most varieties. That's the prediction Darwin tested with his counting back in Chapter 2.

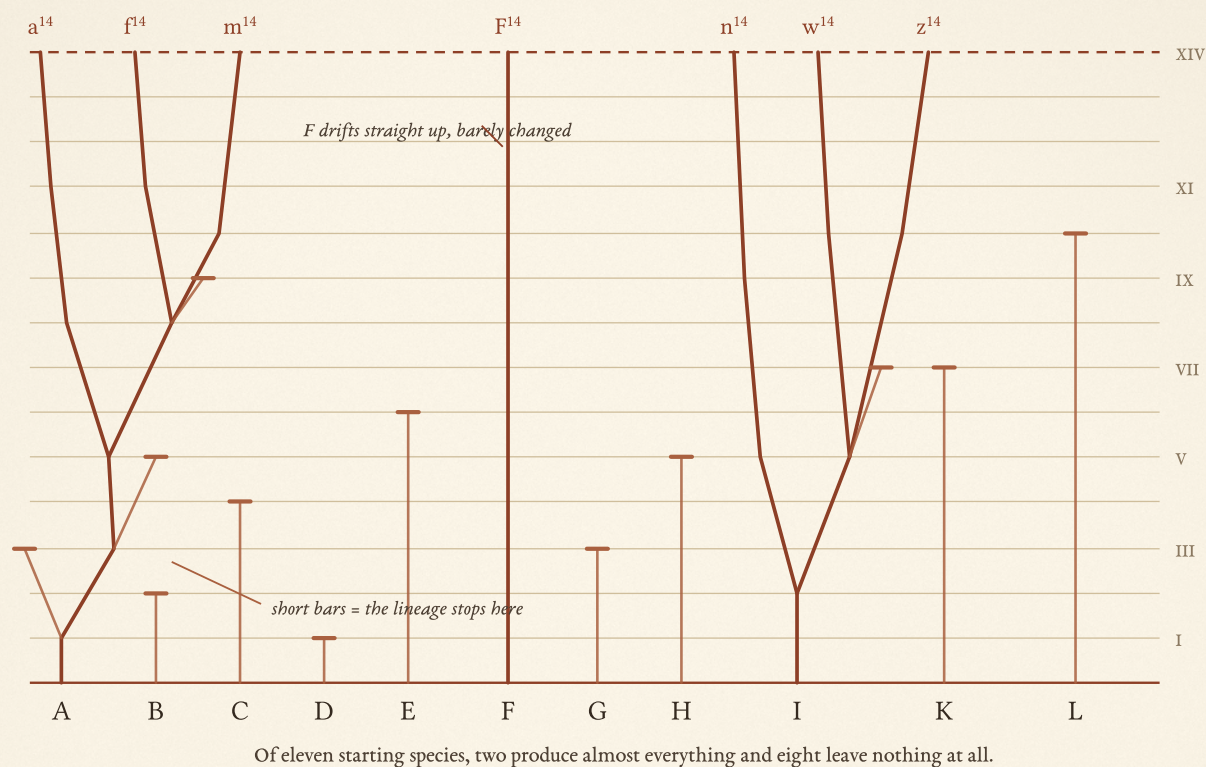


FIGURE 11 Darwin's diagram, redrawn. Time runs upward; each horizontal line is a thousand generations or more. This single picture is the argument of the entire book.

Four things this picture is telling you

1. New species come from branching, not from marching. Nothing turns into something else in a straight line. A lineage splits, and both halves carry on. This is why “did humans come from monkeys?” is the wrong shape of question — we share a fork with them, we didn't come from the end of their branch.
2. Most branches stop. Look at how many lines just end. Eight of the eleven starting species leave nothing whatsoever. Extinction isn't an accident that occasionally interrupts the process — it is most of what the process consists of.
3. The gaps are dead branches. At the top, a^{14} and z^{14} are wildly different. Everything that once connected them is gone. That's why modern groups look separate: the joins are in the ground, not around us.
4. F barely changes at all. One line goes straight up for fourteen thousand generations, unaltered. If your conditions don't change and you're already fitted to them, selection is a force for *staying the same*. Nothing in the theory requires anything to keep changing.

MY TAKE — THE SNEAKIEST CLAIM IN THE CHAPTER

Look at the top row again. The descendants of A have spread so far from the descendants of I that a naturalist would file them in separate genera, maybe separate families — without ever suspecting they came from neighbours in the same genus.

So genus, family, order, class — the whole filing cabinet biologists had been building since Linnaeus — are not a system somebody invented. They are a family tree, drawn by people who did not know they were drawing one.

That's an audacious thing to slip in halfway up a diagram, and Darwin spends Chapter 13 cashing it in.

SECTION EIGHT

VIII

The Tree of Life

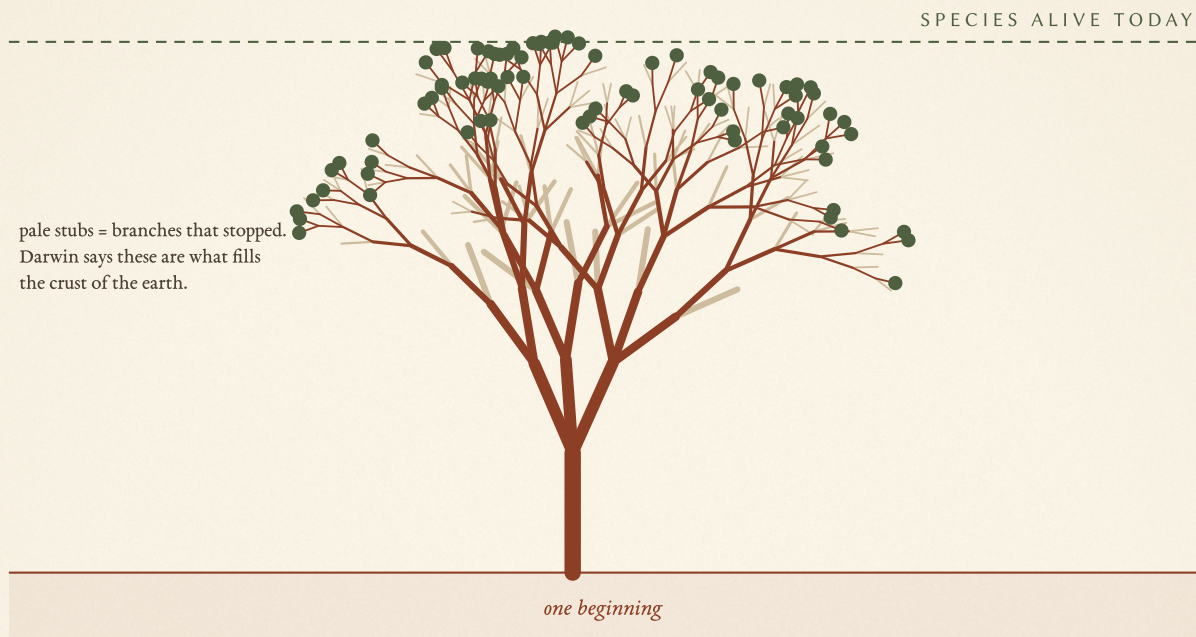
The last page of Chapter 4, where Darwin drops the diagram and reaches for an image instead — and where the book quietly stops being about pigeons.

Having spent ten pages on a chart of lettered lines, Darwin closes the chapter by turning it into something you can actually see. It's the best writing in the book, and it's doing something much bigger than it lets on.

THE PASSAGE EVERYONE REMEMBERS

“As buds give rise by growth to fresh buds, and these, if vigorous, branch out and overtop on all sides many a feebler branch, so by generation I believe it has been with the great Tree of Life, which fills with its dead and broken branches the crust of the earth, and covers the surface with its ever branching and beautiful ramifications.”

WHAT HE MEANS — Living species are the green buds at the tips. Every extinct species is a broken branch, and the broken branches are what the rock under your feet is full of. *Ramifications* just means branchings.



Every green bud is a species now living. Every pale stub is one that isn't.

FIGURE 12 *The Tree of Life*, drawn the way Darwin describes it. Notice how little of it reaches the top — the overwhelming majority of what has ever lived is broken branch.

Two things about this image are worth saying out loud, because Darwin very carefully doesn't.

MOST OF THE TREE IS DEAD

Look at the picture. The green tips are a thin fringe. Everything alive right now — every animal, plant, fungus and bacterium on earth — is the outermost skin of a structure that is overwhelmingly made of things that ended. The usual estimate is that upwards of ninety-nine per cent of all species that have ever existed are extinct.

We are not the point of the tree. We are the few twigs that happen to be green at this exact moment.

A TREE HAS ONE TRUNK

And this is the thing he doesn't say.

If you follow the branches down — past genus, past family, past order, past class — they keep joining. A tree doesn't have eleven separate roots. It has one.

Which means every living thing is related to every other living thing, and there was a point, unimaginably far down, where the ancestors of an oak tree and the ancestors of you were the same organism.

WHY HE BURIED IT IN A METAPHOR

Darwin does not write “therefore all life shares one ancestor and humans are animals like the rest.” He writes a beautiful paragraph about a tree, and moves on to Chapter 5.

He knew exactly what he was implying. He’d known since 1837, when he sketched a little branching tree in a private notebook and wrote “I think” above it. He waited twenty-two years, and even then he handed it over as an image rather than a claim.

Reading it now, with everything that followed, it feels like a man putting something down very gently and stepping back.

SECTION NINE

IX

What to watch out for in this chapter

Five corrections. Most arguments about evolution are really arguments about one of these.

1. EVOLUTION AND NATURAL SELECTION ARE NOT THE SAME THING

People use them interchangeably and they shouldn’t. Evolution is the fact that populations change over generations. Natural selection is one mechanism that causes it. Darwin was careful about this from the Introduction onward — natural selection is the “main but not exclusive” means of change. There are others, and modern biology has found several he had no way of knowing about.

2. IT ISN’T GOING ANYWHERE

There is no ladder, no ranking, no direction of travel. Later species aren’t more advanced, just differently fitted. A tapeworm is not a failed mammal — it is superbly fitted to being a tapeworm, and it got that way by losing organs it no longer needed.

Look at F on the diagram again. Fourteen thousand generations, unchanged. That’s not failure. That’s a good fit to conditions that didn’t move.

3. IT DOESN’T ACT FOR THE GOOD OF THE SPECIES

You hear “the herd does this for the survival of the species.” That isn’t how the machine works. Selection acts on *individuals* and their offspring. A trait that helped the species while harming the individual carrying it would be selected *out*, because that individual leaves fewer descendants. Genuine cooperation exists, but it needs an explanation in terms of individual advantage.

4. “SURVIVAL OF THE FITTEST” ISN’T IN THIS CHAPTER

In 1859 the chapter is titled simply *Natural Selection*. Herbert Spencer coined the other phrase afterwards, Wallace urged Darwin to adopt it, and by the fifth edition the chapter title had become *Natural Selection; or the Survival of the Fittest*.

It was arguably a mistake. Read literally, “the fittest survive” sounds circular — who are the fittest? the ones that survived. Darwin’s own phrasing avoids the trap entirely: some inherited variations lead to more surviving offspring than others, and those variations become commoner. No circle.

5. WHAT DARWIN WAS STILL MISSING — AND IT NEARLY SANK HIM

The chapter has a hole in it that Darwin could not see, and eight years later an engineer named Fleeming Jenkin put his finger on it.

Everyone at the time assumed inheritance *blends* — that a child is an average of its parents, like mixing paint. If that’s true, natural selection cannot work. Any favourable new variation would be halved in the first generation, quartered in the next, and diluted into nothing long before it could spread. Jenkin said so in print, and Darwin had no answer.

THE ANSWER ALREADY EXISTED

Inheritance doesn’t blend. It comes in discrete units that stay whole and get reshuffled — which is why a hidden blue pigeon can reappear intact two generations later, exactly as Darwin saw in his own garden in Chapter 1 and could not explain.

Gregor Mendel published that in 1866, seven years after *Origin*. Nobody read it for thirty-four years. Darwin died in 1882 still worrying about a problem that had been solved, in print, in his own lifetime.

REFERENCE

Every hard word in this part

Same rule as always — explained the way I’d explain it to a ten-year-old.

Natural Selection

Helpful inherited differences becoming commoner over generations because their owners leave more offspring. Not a force, not a chooser — a name for a result.

Sexual Selection

The same machinery, but scored on matings instead of survival. Runs two ways: males competing with males, and females choosing. Builds weapons and ornaments.

Divergence of Character

Relatives being pushed apart, because the more different you are from your closest competitors, the less you have to fight them. Darwin’s own favourite idea.

Economy of Nature

Darwin's phrase for all the different ways of making a living available in a place. Today we'd say *niches*. Being different means getting a slot nobody else is in.

Extinction

A lineage ending. In this chapter it isn't bad luck — it's the direct result of something nearby getting better. Improvement and extinction are one event seen from two sides.

Intermediate Forms

The in-between creatures linking two modern groups. They're missing because they were squeezed between two winners and destroyed first. The gaps are wreckage, not evidence.

Insensibly

Below what anyone could sense. Darwin's word for changes too slow and small to perceive — not too small to matter.

Genus, Family, Order, Class

The nested boxes biologists file life into. The diagram's claim: these aren't a human invention, they're a family tree that people had been drawing without realising.

Tree of Life

Darwin's closing image. Green buds are living species, broken branches are extinct ones, and the whole thing has one trunk.

Blending Inheritance

The old, wrong idea that children are an average of their parents, like mixed paint. If it were true, natural selection could not work — every new variation would dilute away.

Lines worth remembering

If you forget everything else from Part Three, keep these eight.

- 1 Natural selection isn't a claim you have to accept. It's what follows automatically once you accept variation, inheritance, and too many births.
 - 2 It is a sieve, not a chooser. Nothing decides anything. The sorting happens because some individuals leave more descendants than others.
 - 3 It cannot plan ahead. Every step has to pay for itself in this generation, or there is no next step to build on.
 - 4 Nature beats the breeder because it works on every hidden organ, never gets bored, and has had hundreds of millions of years.
 - 5 Sexual selection is scored on matings, not survival — which is why it can build a tail that makes its owner easier to catch.
 - 6 Being different from your relatives pays, because your relatives are your fiercest competitors. That's how one species becomes two.
 - 7 The missing in-between creatures are missing *because* they were in between. Gaps are what the process leaves behind, not what refutes it.
 - 8 A tree has one trunk. Darwin never says the words, but that is the whole implication, and he knew it in 1837.
-

Part Three on one page

Tear this out. It's the whole thing in ninety seconds.

THE ARGUMENT, COMPLETE

More are born than can survive. Individuals differ. Some differences help. Offspring resemble parents. Therefore the helpful differences get commoner each generation, with nobody choosing and nobody watching. Natural selection is a consequence, not a claim.

WHAT IT IS NOT

Not a force, not a planner. It cannot look ahead, cannot act for another species' benefit, and cannot make anything perfect — only better than the neighbours, here, now. "Selection" is a misleading word: think of a sieve, which sorts without deciding.

WHY NATURE BEATS THE BREEDER

A human selects only visible traits, for his own purposes, carelessly, over a few thousand years. Nature acts on every internal organ, for the creature's own survival, without pause, over hundreds of millions of years — registering differences far too small for anyone to see.

SEXUAL SELECTION

A second engine, scored on *matings* rather than survival. Males competing produces weapons — antlers, spurs. Females choosing produces ornament — colour, song, display. Losing doesn't kill you, it just leaves you with no descendants, which counts the same. That is why a peacock's tail is worth its cost.

DIVERGENCE OF CHARACTER — THE IDEA HE WAS PROUDEST OF

Your closest relatives are your fiercest competitors, so any oddity that moves you sideways out of the fight is rewarded. The extremes prosper, the middle gets squeezed out, and one species becomes two.

THE DIAGRAM, AND WHAT IT SAYS

1. Species arise by branching, not by marching in a line.
2. Most branches stop. Eight of eleven starting species leave nothing at all.
3. The gaps between modern groups are dead branches — the in-between forms were squeezed between two winners and died first.
4. One lineage goes straight up unchanged. Nothing requires anything to keep changing.

And so genus, family and order aren't a filing system somebody invented — they are a family tree biologists had been drawing without knowing it.

THE THING HE DOESN'T SAY

He ends with the Tree of Life: green buds are living species, broken branches fill the crust of the earth. And a tree has one trunk. He leaves that entirely to you.

Part Four

Chapter 5: Laws of Variation · Chapter 6: Difficulties on Theory

The engine is built and running. From here the book changes character entirely: Darwin stops making his case and starts stress-testing it, and he is harder on himself than any of his critics managed to be.

Chapter 5 goes back to the thing he waved past in Chapter 1 — where does variation actually come from? This is his weakest chapter, because the honest answer in 1859 was “nobody knows,” and rather than say so he reaches for causes that turned out to be wrong: the direct effect of conditions, and the inherited effects of use and disuse. It’s worth reading anyway, because watching a careful man be wrong in public is instructive, and because the observations he makes along the way are excellent even when his explanations aren’t.

Chapter 6 is the opposite, and it’s one of the bravest things in nineteenth-century science. Darwin sits down and lists every objection he can think of to his own theory — not softened, not strawmanned. Why don’t we see countless transitional forms? How could a land animal possibly become a bat, or a whale? And the one everybody still reaches for: how could something as intricate as an eye be built by accumulating small accidents?

He puts that last one in the strongest terms he can manage, calls the idea that an eye formed by natural selection “absurd in the highest possible degree,” and then spends the next several pages taking it apart.

Part Four is where you find out whether the machine survives contact with the hard cases.



End of Part Three of Eight · *The Engine*
My own reading of Darwin — Lovepreet Singh