# Oxygen Summary

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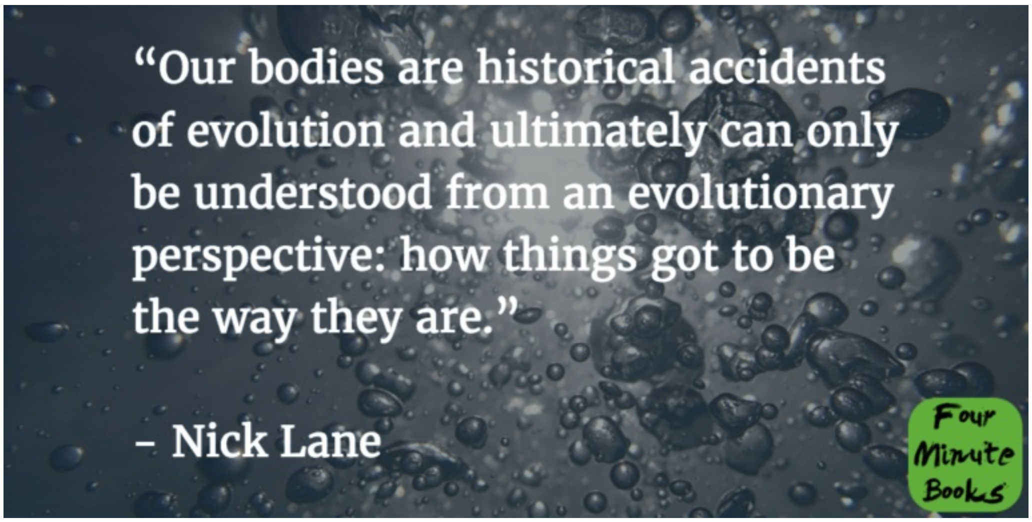
**1-Sentence-Summary:** *Oxygen helps you understand the biology of our evolution by taking a close look at the molecule that can make and break all life and how it's shaped the rise of animals, plants and humans, as well as why it might be the key to ending aging.*

**Read in:** 4 minutes

**Favorite quote from the author:**




Did you know breathing is literally killing you, one breath at a time?

Don't worry, you don't have to hold your breath now, it's a natural part of life, but it's still fascinating to learn about the both life-supporting and deadly capacities of what might be the most important molecule in our world: *Oxygen*.

Talk about an out of the box book. I had this sitting in my library on Blinkist for a while now, and finally got around to it. I never looked at oxygen as such a key part of the evolution of the world, but it of course makes sense – no oxygen in the air, no survival for humans or animals.

Nick Lane is a British biochemist and researcher in the field of evolutionary biology, who works at the University College London. He's published 4 books about these topics, and this is one of them.

Here are 3 lessons about how oxygen runs the show:

1. Oxygen is what made multi-cellular life possible.
2. Giant animals existed because of high atmospheric oxygen levels.
3. Your breathing determines how fast you age.

Take a deep breath and then let's explore the 21% of our air that make your lungs go round!

## Lesson 1: Without an increase in oxygen, multi-cellular life wouldn't have developed.

Most of the organisms we know and interact with today are multi-cellular. Animals, humans, and most plants on earth have many different types of cells. But life didn't start that way.

Around 500 million years ago, most of earth's organisms were uni-cellular – they only had one type of cell. For those organisms, oxygen was a death threat. They didn't have any anti-oxidants, so when exposed to O2, it'd steal their cells' electrons and make them disintegrate (kinda like this).

During that time, the Cambrian Explosion, plants were the only remaining survivors of a long ice age. Since they photosynthesized a lot of oxygen to survived, it amassed in the atmosphere and oceans.

All of the single-cell organisms in the water tried to escape from all the oxygen around them, but with so much oxygen *everywhere*, they had no choice but to huddle up together and form a single mass. **Eventually, many single-cell organisms integrated into the first multi-cellular organisms, which led to the start of evolution as we know it**.

Ironic, huh? More oxygen, more organisms trying to escape it, and the result? Multi-cellular organisms, which thrive on oxygen.

Because the floods from the ice age then washed out tons of minerals and nutrients from the earth, these new organisms lived in an evolutionary utopia, and that's why they developed so fast (hence the term "explosion").

## Lesson 2: Giant animals could exist because of high levels of atmospheric oxygen.

In fact, animals were on a meteoric rise in terms of sophistication and size after that point. Fast forward 200 million years from what we just talked about (that puts us 300 million years ago) and if you had walked around outside back then you'd have seen dragonflies with wings spanning 2 feet (65 cm), scorpions of over 3 feet in length (1m) or mayflies with huge wings.

The reason these animals could grow to such huge sizes is that **the atmospheric oxygen level was about 35%** (as opposed to 21% today).

This not only meant more oxygen for breathing and cell growth, but also that moving around was a lot easier, thanks to the oxygen-rich environment. For example, huge dragonflies wouldn't be able to fly in today's 21%-oxygen air, but could generate enough lift for taking off when oxygen levels were that high.

Similarly, air provided less resistance against moving objects at those oxygen levels, so scorpions and other land animals could run and move faster, thus getting an advantage when hunting for food.

## Lesson 3: Your breath is what determines how fast you age.

Did you know that breathing is toxic?

While absolutely crucial for staying alive (after all, you couldn't even last 10 minutes without air), breathing also produces toxic byproducts, such as the hydroxyl radical (OH•), which accumulate in your body over time and cause damage.

**Breathing is like getting oxygen poisoning – just reaaaaally slowly, over multiple decades** – and is therefore a determinant of how fast you age.

Scientists often use something called base metabolic rate, which is the amount of oxygen consumed in liters per kg of bodyweight per hour (l(O2)/kg/hr) to calculate how much oxygen an animal consumes over its lifetime.

For example, a horse with a metabolic rate of 0.2 consumes 60,000 liters of oxygen over 35 years – a common lifespan among horses. Yet, a squirrel might live only 7 years, but consume just as much oxygen (because it's metabolic base rate is five times higher – 1.0).

However, that doesn't mean the amount of oxygen you can breathe in your life is fixed – it's not like we all drop dead once we hit 60,000 liters. For example, bats can live up to 20 years, even though they have just as high a metabolic rate as mice, which only live three years on average.

It's more about how much toxins your body produces while breathing, and that too can vary a lot. If we learn how to control and improve this, this might be the breakthrough we need to end aging.

## Oxygen Review

It's fun to learn from books like *Oxygen* on occasion, because it's no subject you usually concern yourself with. Most people, who don't study biology, would never come across this topic (or buy a textbook about it).

Great job by Dr. Lane and a big thumbs up for helping you and me learn more about the air we breathe!

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## What else can you learn from the blinks?

- How photosynthesis isn't the only way of creating oxygen, but the safest one
- What scientists do to determine past historic levels of atmospheric oxygen
- Why oxygen is remarkably similar to radiation
- How Vitamin C isn't always healthy
- The two main theories behind why we age

## Who would I recommend the Oxygen summary to?

The 13 year old high school girl with a knack for biology, the 37 year old school teacher, who's permanently stressed and has asthma problems, and anyone who likes mystery stories of giant, prehistoric animals.