THE LISTENING GENOME · COMPANION

The Listening Workbook

Every practice and Try It at Home sheet from the book, ready to print, with its plates and figures in full color, and room to write down what your own surroundings are telling you.



Christian Duarte, PhD

ZEN BOOKS

A free companion for readers
christianduarte.com/genome-companions

BEFORE YOU START

How to Use This Workbook

This workbook follows the book chapter by chapter. Print the pages you need, or fill them in on a tablet. Nothing here replaces the chapter it comes from: read the chapter first, then come here to do it. Every step that rests on a study carries the same seal as in the book, so you always know how sure the ground is under your feet.

STRONG ●●●

Many good studies by different groups that agree, or a mechanism taken apart step by step.

In the book: **DNA carries heredity.**

MODERATE ●●○

Good evidence with a limit you should know: one large study, one kind of population, a young measure.

In the book: **sensitivity is about 47 percent heritable.**

PRELIMINARY ●○○

Interesting but not yet repeated, from a small sample, or from animals only.

In the book: **the telomeres of forty boys in Chapter 13.**

UNSUPPORTED ○○○

In circulation, often in books like this one, with no good evidence behind it.

In the book: **you can rewrite your DNA with your thoughts.**

15
Practices
One for the Introduction and each chapter, with its steps as color cards and space to write.

8
Try It at Home
The book's kitchen and windowsill experiments, with full logging sheets.

4
New exercises
Not in the book: a home audit, a sensitivity map, a headline card, and a 30-day plan. Plus the plates in full color.

LOOK FOR THE AUDIO

When a page has a guided audio, you will see this tag. Press play, and keep your hands free.

▶ Audio 1 · *The White Thread*

WRITE IN IT

Your notes are the point. The studies in the book describe groups of people; your pages describe one person, you.

KEEP IT HONEST

A week of notes is not an experiment. It is a fair comparison with yourself, and that is already a lot.

INSIDE

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YOUR GUIDED AUDIOS

Four Audios, in My Voice

Some practices are easier with your hands free and your eyes off the page. These four short audios walk you through them in real time, with the pauses where you need them. Download them from the same page as this workbook.

1 AUDIO

The White Thread

ABOUT 13 MINUTES · IN THE KITCHEN · CHAPTER 1

The strawberry DNA experiment, step by step, with the waiting times built in, so your hands can stay busy. It opens with Friedrich Miescher in the castle kitchen at Tübingen.

Goes with: Page with DNA in Your Kitchen

2 AUDIO

The Listening Walk

ABOUT 9 MINUTES · OUTDOORS, FIRST HOUR OF THE MORNING · CHAPTERS 10–12

Light, green, and sound on a short morning walk, with a minute of counting sounds and a minute of looking at one tree. It works on a city block.

Goes with: Step 1 of Light on Your Side; Your Dose of Green; A Week of Listening

3 AUDIO

Lights Down

ABOUT 8 MINUTES · EVENING, AT HOME · CHAPTERS 11 AND 14

A walk through your rooms as the evening begins: the overhead lights off, lamps low and warm, the four questions from Chapter 14, and the two-minute notebook.

Goes with: Steps 2–4 of Light on Your Side; A Week to Tune Your Surroundings

4 AUDIO

The Quiet Room

ABOUT 7 MINUTES · BEDTIME · CHAPTER 12

Sets up the night recording, checks the window and the gaps, and fits your earplugs with you, counting to ten while the foam expands.

Goes with: Record Your Night; Less Noise

Where to find them: christianduarte.com/genome-companions. When a page in this workbook has an audio, you will see the dark tag with the yellow play button next to its title.



INTRODUCTION

Before We Start

THE CHAPTER IN THREE LINES

People born in the same year can age at very different speeds, and by thirty-eight the difference can already be measured in the blood and seen in the face.

Part of that difference seems to come from the lives they have lived, and some people seem to absorb their surroundings, good and bad, more deeply than others.

This book follows that signal from the senses to the DNA, and tells you at every step how strong the evidence is.

IN THIS WORKBOOK Practice · A Week of Listening

Audios 2 & 3 · *Morning and evening*

INTRODUCTION · PRACTICE

A Week of Listening

Audio 2 · *The Listening Walk*

Audio 3 · *Lights Down*

Before we start on the cell, listen to your own surroundings for a week. This is an observation exercise, not a treatment, so it carries no seal. Its purpose is to give you your own data to hold up against the studies in the chapters that follow. Two minutes each evening.

1



EACH EVENING

Light

How much daylight you saw, and how bright the screens and lamps were after dark.

2



EACH EVENING

Sound

The loudest stretch of the day, and the quietest.

3



EACH EVENING

Green

Any trees, plants, or sky you looked at for more than a minute, through a window too.

4



EACH EVENING

People

Who you spent the most time with, and whether it left you fuller or emptier.

TWO SCORES, KEPT APART

Next to your notes, score from 1 to 5 how **drained** you felt and how **settled** you felt. Keep them separate: on some days both are high.

NO PARK? IT STILL COUNTS

The window counts, a plant on the sill counts, and so does the sky above the street. Many of the studies in Part IV were done with people who had little more than that.

AT THE END OF THE WEEK

Read the whole week in one go. Look for one pattern only, the one that surprises you most, and write it here. Then keep this page: in Chapters 10, 11, and 12 you can set your week beside what the research found.

NOTES

INTRODUCTION · PRACTICE

A Week of Listening

Two minutes each evening. Three notes about the day's surroundings, two scores, one line about people. At the end of the week, read it all at once and underline the one pattern that surprises you most.

	LIGHT	SOUND	GREEN	
1 MON	Daylight seen · screens and lamps after dark	Loudest stretch · quietest stretch	Trees, plants, or sky for over a minute	**Drained** 1 2 3 4 5 **Settled** 1 2 3 4 5 **People** ◯ fuller ◯ emptier
2 TUE	Daylight seen · screens and lamps after dark	Loudest stretch · quietest stretch	Trees, plants, or sky for over a minute	**Drained** 1 2 3 4 5 **Settled** 1 2 3 4 5 **People** ◯ fuller ◯ emptier
3 WED	Daylight seen · screens and lamps after dark	Loudest stretch · quietest stretch	Trees, plants, or sky for over a minute	**Drained** 1 2 3 4 5 **Settled** 1 2 3 4 5 **People** ◯ fuller ◯ emptier
4 THU	Daylight seen · screens and lamps after dark	Loudest stretch · quietest stretch	Trees, plants, or sky for over a minute	**Drained** 1 2 3 4 5 **Settled** 1 2 3 4 5 **People** ◯ fuller ◯ emptier
5 FRI	Daylight seen · screens and lamps after dark	Loudest stretch · quietest stretch	Trees, plants, or sky for over a minute	**Drained** 1 2 3 4 5 **Settled** 1 2 3 4 5 **People** ◯ fuller ◯ emptier
6 SAT	Daylight seen · screens and lamps after dark	Loudest stretch · quietest stretch	Trees, plants, or sky for over a minute	**Drained** 1 2 3 4 5 **Settled** 1 2 3 4 5 **People** ◯ fuller ◯ emptier
7 SUN	Daylight seen · screens and lamps after dark	Loudest stretch · quietest stretch	Trees, plants, or sky for over a minute	**Drained** 1 2 3 4 5 **Settled** 1 2 3 4 5 **People** ◯ fuller ◯ emptier

PART I

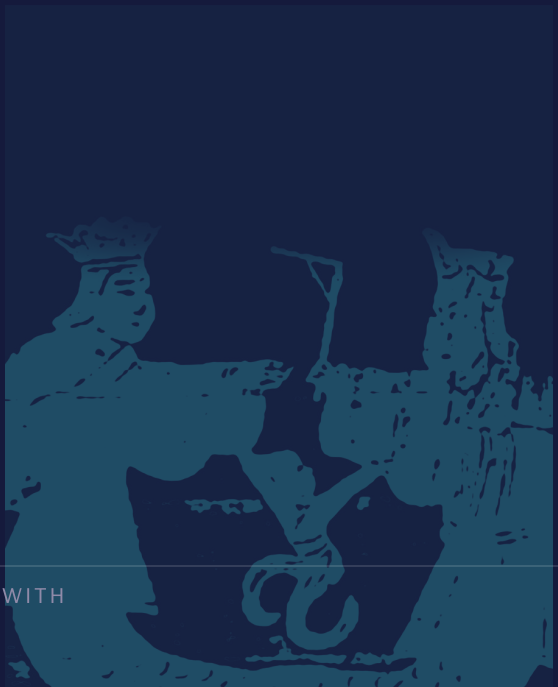
What You Were Born With

How much of you was written before you were born, and why the answer is never one gene. Three chapters, three hands-on experiments with things from your kitchen and your garden.

1 The Bandages of Tübingen

2 Twins

3 The Gene That Wasn't





PART I · CHAPTER 1

The Bandages of Tübingen

THE CHAPTER IN THREE LINES

Almost every cell in your body keeps the same text, about three billion letters of DNA per set, folded into a nucleus smaller than the dot on an i.

A gene is a passage in that text; reading different passages is what makes a cell become skin, liver, or neuron.

Your surroundings rarely change the text, but they do change which passages are read, and that is where this book begins.

IN THIS WORKBOOK Practice · DNA in Your Kitchen

Audio 1 · *The White Thread*

DNA in Your Kitchen

Audio 1 · *The White Thread*

About twenty minutes, very little money, any kitchen. You will see the white tangle with your own eyes and understand, in your hands, what Miescher was doing in his castle kitchen.

WHAT YOU NEED

- [ ] 3 or 4 strawberries, fresh or thawed
- [ ] Half a glass of water
- [ ] ½ teaspoon of salt
- [ ] A tall, narrow glass
- [ ] A sealable plastic bag
- [ ] 1 teaspoon of dish soap
- [ ] Coffee filter, or a sieve with a paper towel
- [ ] A wooden skewer or toothpick
- [ ] **Isopropyl alcohol, 70 percent or more** (or 96 percent ethanol), in the freezer for at least an hour beforehand

1 2 MIN



MASH

Break the Walls

Stir the water, soap, and salt gently, without foam. Strawberries in the bag, three or four spoonfuls of the mix, seal, and squash until there are no lumps.

2 5 MIN



FILTER

Keep the Liquid

Pour the pulp through the filter into the tall glass. Let it drip until you have a finger or two of clear pink liquid. Do not squeeze.

3 2–3 MIN



COLD ALCOHOL

Slide It Down

Tilt the glass and let the frozen alcohol slide very slowly down the side, until it forms a clear layer as thick as the pink one. Do not stir. Wait.

4 1 MIN



WIND

Lift the Thread

Where the layers meet, a cloudy white mass rises. Dip the skewer and turn it slowly, as if winding wool.

WHAT HAPPENED IN THE GLASS STRONG

The soap dissolves the fatty membranes of the cells and their nuclei, which lets the DNA out. The salt helps the long molecules clump together. DNA does not dissolve in alcohol, so where water meets cold alcohol it comes out of solution and becomes visible. Each strawberry cell carries eight copies of every chromosome, against the two in yours.

SAFETY

The alcohol is flammable and must not be drunk: keep it away from any flame or stove burner. With children, which I recommend, an adult handles the alcohol. No strawberries? A ripe banana or a kiwi works too.

YOUR GLASS

Fruit used, and how long until the white tangle appeared:

What it looked like, in your own words:



PART I · CHAPTER 2

Twins

THE CHAPTER IN THREE LINES

Identical and fraternal twins let science estimate heritability: for sensitivity, about 47 percent of the differences between people go with differences in their genes.

Heritability describes a group in a given place and time, not the recipe of one person, and a highly heritable trait can still change a great deal with the environment.

The experiences that are unique to each person, not the home that siblings share, carry most of the environment's weight, and they slowly underline the same text in different ways.

IN THIS WORKBOOK Try It at Home · Two Clones, Two Windows · Practice · Your Family's Sensitivity Map

CHAPTER 2 · TRY IT AT HOME

Two Clones, Two Windows

Identical twins are rare in people and common in the garden. Every cutting that grows roots is a clone, with exactly the same DNA as its parent. With two of them you can do what no scientist can do with two children: raise them on purpose in different homes.

WHAT YOU NEED

- [ ] A mint or basil plant (a supermarket pot will do)
- [ ] Scissors and a ruler
- [ ] Your phone for photos
- [ ] Two glasses of water
- [ ] Tape and a pen for labels

1



CUT

Two Matching Cuttings

Two stems about 4 inches (10 cm) long from the same plant, same number of leaves. Label the glasses. Roots in 7–10 days.

STRONG

2



SEPARATE

Light and Shade

One by the brightest window, one in a dim corner where you could read only with effort. Same temperature, same water day.

STRONG

3



MEASURE

One Photo a Week

Side by side on a white background, ruler next to them. Height, number of leaves, gap between two pairs of leaves.

STRONG

4



COMPARE

Same DNA, Different Body

After 3 or 4 weeks: one tall and pale, one compact and green.

STRONG · IN PLANTS

WHAT HAPPENED IN THE GLASS STRONG · IN PLANTS

The clone in the dim corner usually grows taller and thinner, with longer gaps and paler leaves: it stretches as if neighbors were blocking the light. Plants read light with proteins called phytochromes, and that reading changes which genes are switched on. Same text, a different body.

KEEP IT FAIR

If one rots or fails to root, start again with a fresh pair. Never leave one in total darkness: it would die and teach you nothing. A plant is not a person; they share the logic, not the mechanism.

CHAPTER 2 · LOGGING SHEET

Your Notebook: Two Clones

One row per weekly photo. Measure from the rim of the glass to the tip of the stem.

WEEK	DATE	HEIGHT	LEAVES	GAP BETWEEN LEAF PAIRS	COLOR: PALE · MID · DEEP GREEN
WINDOW CLONE					
Week 1					
Week 2					
Week 3					
Week 4					
SHADE CLONE					
Week 1					
Week 2					
Week 3					
Week 4					

VARIATION: A THIRD CLONE IN HALF-LIGHT

The response comes in degrees, not all or nothing. Week 4 height:

WHAT YOU SAW AFTER FOUR WEEKS

NOTES

CHAPTER 2 · PRACTICE

Your Family's Sensitivity Map

Twenty minutes, a sheet of paper, and a pencil. It does not diagnose anything, and no single family can separate genes from upbringing. What it does is let you see the two ideas of this chapter in your own people: sensitivity tends to run in families, and siblings under the same roof still turn out different.

1



20 MINUTES

Draw Your Family

Parents, siblings, grandparents if you knew them, and your children if you have them.

NO SEAL

2



3 REACTIONS

Mark How They React

Noise, light, or crowds; too much at once; beauty and small changes. Strong, medium, or slight.

MODERATE

3



BETWEEN SIBLINGS

Circle the Differences

For each difference, one thing each of them lived alone: a school, an illness, a friend, a move.

STRONG

4



THIS WEEK

Change One Thing

One thing in your surroundings today, not your past: a light, a noise, a crowded schedule.

PRELIMINARY

TWO TIPS

Mark each person as they are on an ordinary day, not their worst. If you can, ask a sibling or a parent to fill out the same map without looking at yours. Where the two disagree is information too.

ADOPTED, OR FEW RECORDS?

Do it with the people you grew up with or live with now. Steps 3 and 4 work exactly the same, and they are the ones that matter most.

NOTES

CHAPTER 2 · WORKSHEET

The Map

S = strong · M = medium · L = slight. One card per person; add names on the top line.

GRANDPARENTS

Noise · light · crowds	S M L	S M L	S M L	S M L
Too much at once	S M L	S M L	S M L	S M L
Beauty · small changes	S M L	S M L	S M L	S M L

PARENTS, AUNTS, UNCLES

Noise · light · crowds	S M L	S M L	S M L	S M L
Too much at once	S M L	S M L	S M L	S M L
Beauty · small changes	S M L	S M L	S M L	S M L

YOU AND YOUR SIBLINGS

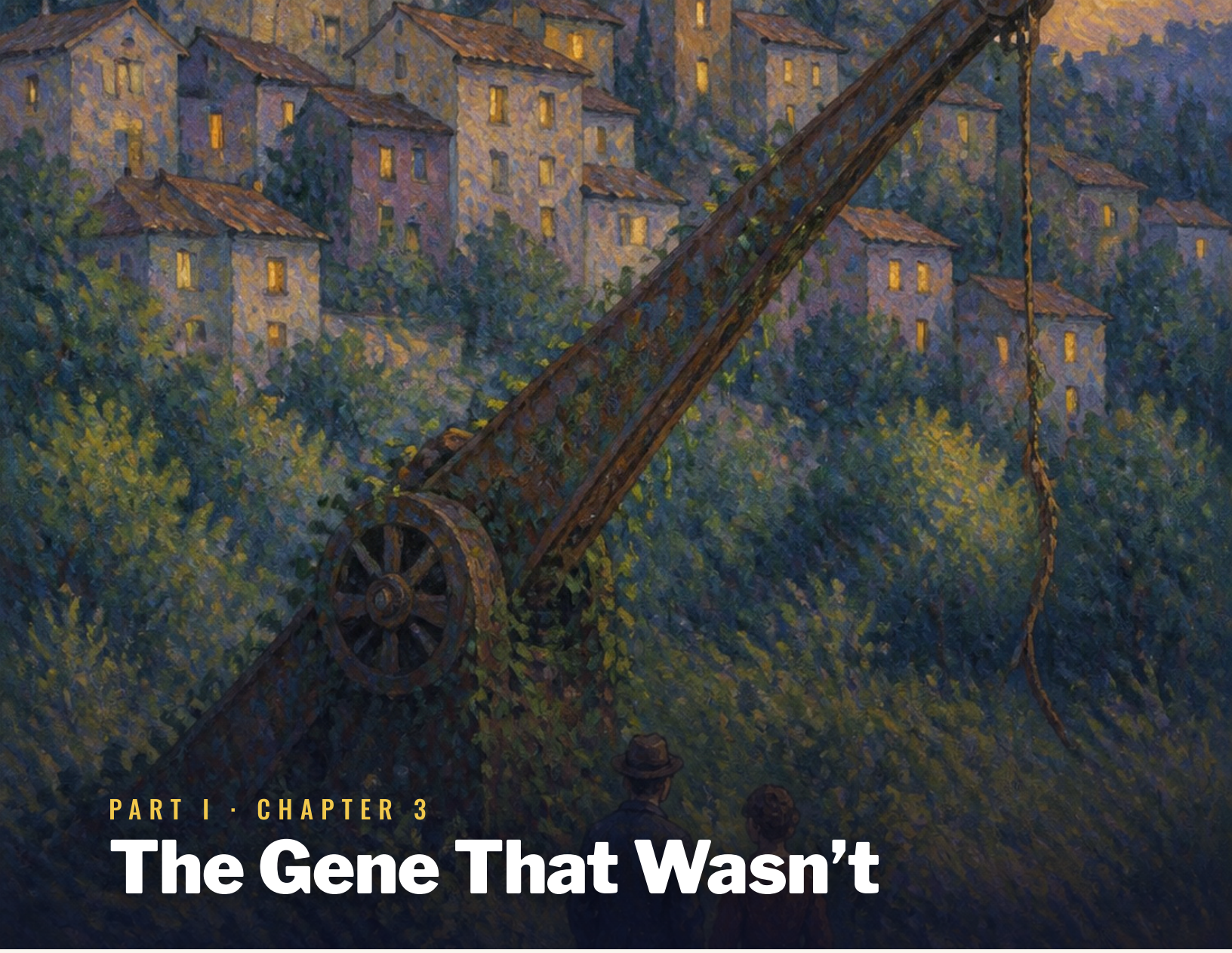
Noise · light · crowds	S M L	S M L	S M L	S M L
Too much at once	S M L	S M L	S M L	S M L
Beauty · small changes	S M L	S M L	S M L	S M L

CHILDREN

Noise · light · crowds	S M L	S M L	S M L	S M L
Too much at once	S M L	S M L	S M L	S M L
Beauty · small changes	S M L	S M L	S M L	S M L

BETWEEN SIBLINGS: WHAT EACH ONE LIVED ALONE

STEP 4: ONE CHANGE I WILL TRY THIS WEEK



PART I · CHAPTER 3

The Gene That Wasn't

THE CHAPTER IN THREE LINES

The most famous "sensitivity gene" in psychiatry, the short variant of the serotonin transporter, did not survive testing in hundreds of thousands of people.

Traits like sensitivity, height, or depression are polygenic: thousands of small dials, most of them in the signposts that decide how strongly genes are read.

A polygenic score describes tendencies across groups; your own reactions still tell you more about your sensitivity than any genetic test available today.

IN THIS WORKBOOK Try It at Home · One Die and Ten Dice · Practice · Read a Gene Headline

One Die and Ten Dice

In 1918 Fisher explained why height does not come in two sizes but in a smooth curve. You can see his idea with your own hands in twenty minutes, and understand along the way why it is so hard to find "the gene for" anything.

WHAT YOU NEED

- [ ] Ten dice, a dice app, or a spreadsheet with RANDBETWEEN(1,6)
- [ ] Graph paper, or the sheet on the next page
- [ ] A pencil

1



ONE DIE

One Gene

Roll it 50 times and tally each number, 1 to 6.

STRONG

2



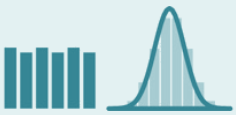
TEN DICE

Ten Genes

Roll all ten together, add them up, and tally the total. Fifty times.

STRONG

3



COMPARE

Flat or Bell

A flat drawing against a bell. Nobody told the dice to make a bell.

STRONG

4



VARIATION

The Gene That Decides

With PTC taste strips, one gene splits people into two clear groups.

STRONG

WHAT HAPPENED ON THE TABLE STRONG

With one die the columns come out about the same height. With ten, about seven in ten totals fall between 30 and 40, and almost none at the ends. Add up many small things and it is rare for all of them to push the same way. Now look at a high total and ask which die was responsible: none in particular.

PTC STRIPS, SAFELY

Only the paper strips sold for biology classes. One per person, touch with the tip of the tongue, then throw it away. Not to be chewed or swallowed; an adult supervises.

NOTES

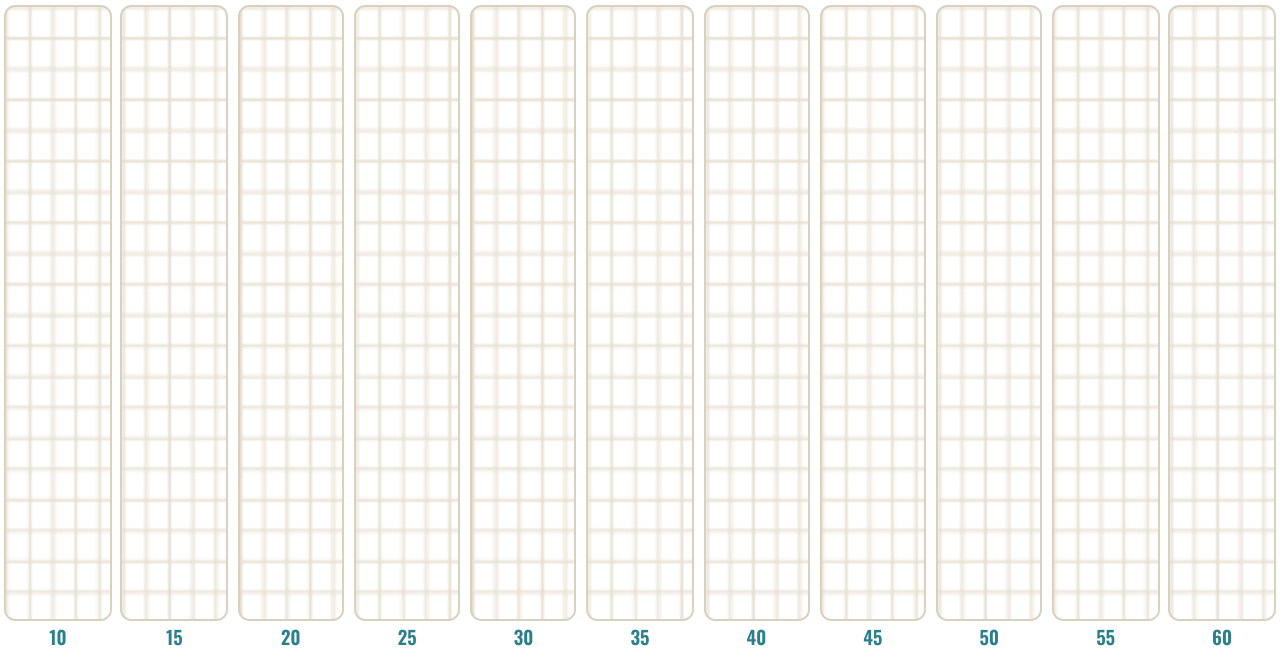
CHAPTER 3 · TALLY SHEET

Flat or Bell?

One mark per roll, stacked from the bottom up.

1 · ONE DIE, 50 ROLLS

2 · TEN DICE, 50 ROLLS: TOTALS IN BINS OF FIVE (10–14, 15–19 … 60)

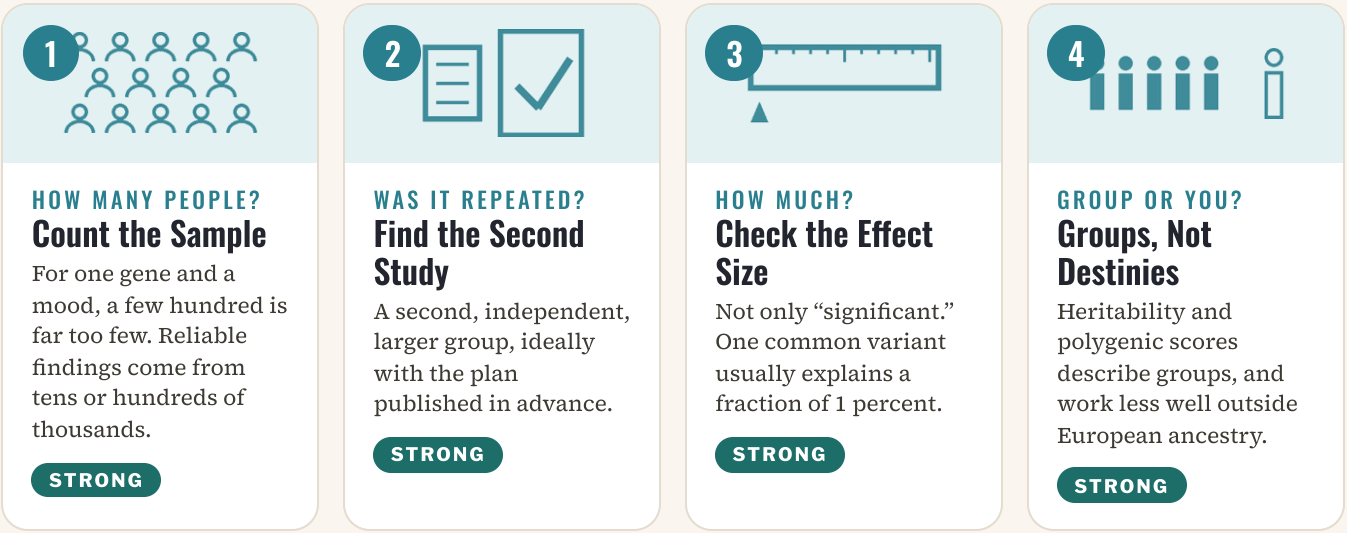


Ten dice are not a genome: in people the effects are not all the same size, the environment adds to the total too, and some variants influence each other. The game teaches the logic of adding up, not the real numbers.

CHAPTER 3 · PRACTICE

Read a Gene Headline Like a Geneticist

No equipment and no yard: the couch, the bus, or a small apartment. The next time a headline says scientists have found “the gene for” anxiety, sensitivity, or happiness, run it through four questions before you let it settle in your head.



HOW MANY PEOPLE?

Count the Sample

For one gene and a mood, a few hundred is far too few. Reliable findings come from tens or hundreds of thousands.

STRONG

WAS IT REPEATED?

Find the Second Study

A second, independent, larger group, ideally with the plan published in advance.

STRONG

HOW MUCH?

Check the Effect Size

Not only “significant.” One common variant usually explains a fraction of 1 percent.

STRONG

GROUP OR YOU?

Groups, Not Destinies

Heritability and polygenic scores describe groups, and work less well outside European ancestry.

STRONG

THE HEADLINE I CHECKED

Headline: _____

Passed: 1 ☐ 2 ☐ 3 ☐ 4 ☐ Verdict: _____

Then turn the question around, toward your own surroundings. Keep this list: you will use it again in Chapter 14.

THREE THINGS THAT TURN MY DIAL UP

1 _____

2 _____

3 _____

ONE THING THAT TURNS IT DOWN

1 _____

NOTES

PART II

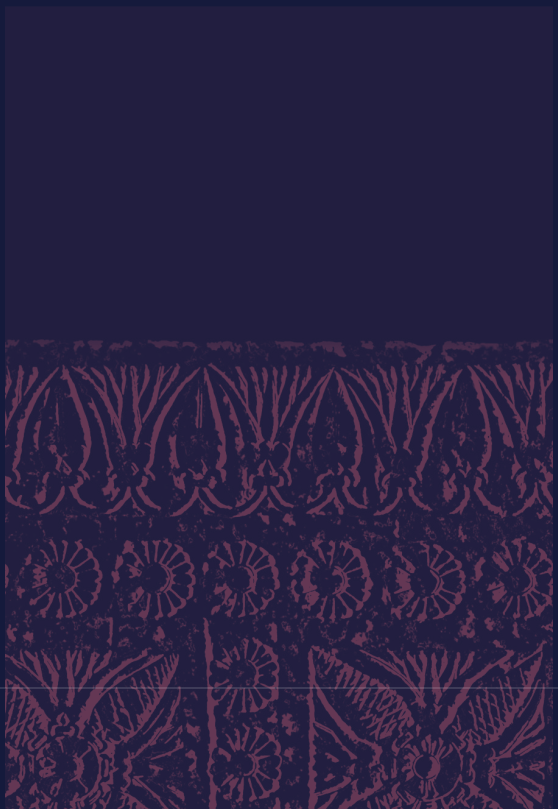
What Life Writes

How experience leaves chemical marks on DNA: in a rat's nest in Montreal, in the womb during a famine and, more controversially, across generations.

4 The Rats That Were Licked

5 The Hunger Winter

6 What Is Passed On, and What Is Not





PART II · CHAPTER 4

The Rats That Were Licked

THE CHAPTER IN THREE LINES

Your cells clip pages of the genome closed with methyl groups, and they copy those clips each time they divide; that is how they remember which genes not to read.

In rats, a mother's licking in the first week leaves fewer clips on the gene for the stress brake, and the effect follows the mother who raises, not the one who gives birth.

In people the link exists but is weaker and harder to measure, the clips are durable but not eternal, and no supplement places them where you want.

IN THIS WORKBOOK Try It at Home · The Stroked Plants · Practice · Read an Epigenetics Headline

The Stroked Plants

You cannot repeat the Montreal rats at home, and you do not need to. In three weeks, with a packet of seeds, you can see that touch changes which genes are switched on and, with them, the shape of a body. The body will just belong to a bean.

WHAT YOU NEED

- [ ] Six bean seeds from the same packet
- [ ] Potting soil
- [ ] Optional: a soft paintbrush
- [ ] Six yogurt cups with holes in the bottom
- [ ] A ruler and a marker

1



SOW

Six Matching Beans

Same packet, same windowsill, same watering. One bean per pot, two fingers deep.

STRONG

2



MARK

Three Get a T

When the plants are about 2 inches (5 cm) tall, mark three pots T, for touched. The other three are never touched.

STRONG

3



STROKE

Ten Seconds

Twice a day, rub each T stem gently up and down between two fingers, without bending it.

STRONG

4



MEASURE

Shorter and Sturdier

Height of all six every two days, for two or three weeks.

STRONG · IN PLANTS

WHAT HAPPENED IN THE POTS STRONG · IN PLANTS

The stroked plants are usually shorter and thicker. Mark Jaffe named it thigmomorphogenesis in 1973. In 1990 Janet Braam and Ronald Davis found genes they called TCH, for touch, whose message rose up to a hundredfold within 10 to 30 minutes. Stop touching, and after a few days they start stretching again.

BEAN, NOT RAT

In the bean, touch travels through calcium and the hormone ethylene, not cortisol or methylation clips. The idea is the rats' idea; the mechanism is not. A paintbrush gives every plant the same touch.

CHAPTER 4 · LOGGING SHEET

Your Notebook: Six Beans

Height in inches or centimeters, from the soil to the top of the stem. Tick the stroke boxes morning (AM) and evening (PM).

DAY	DATE	T1	T2	T3	STROKES AM · PM	U1	U2	U3
Day 0								
Day 2								
Day 4								
Day 6								
Day 8								
Day 10								
Day 12								
Day 14								
Day 16								
Day 18								
Day 20								
Day 22								

AVERAGE HEIGHT AT THE END

Touched (T): _____

Untouched (U): _____

AFTER YOU STOP TOUCHING: ONE MORE WEEK

_____

_____

NOTES

_____

_____

_____

_____

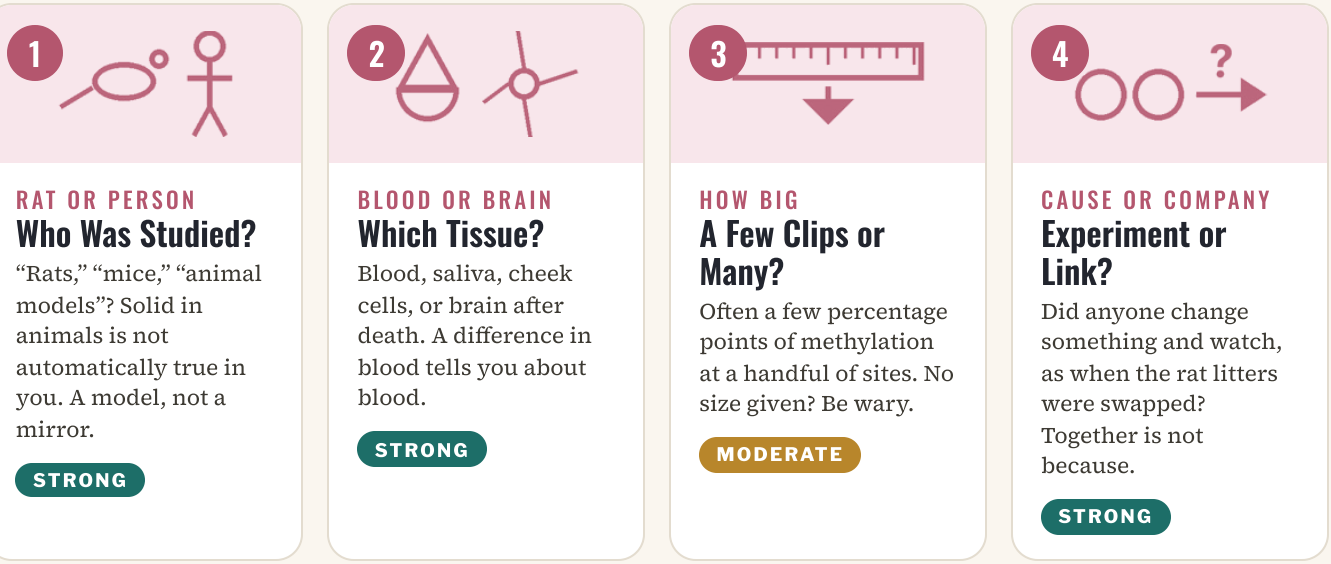
_____

_____

CHAPTER 4 · PRACTICE

Read an Epigenetics Headline

"Your childhood rewired your DNA." "This food switches off your bad genes." There is no way to remove clips from a gene, but there is a two-minute filter for these headlines. Any article, any sofa.



RAT OR PERSON

Who Was Studied?

"Rats," "mice," "animal models"? Solid in animals is not automatically true in you. A model, not a mirror.

STRONG

BLOOD OR BRAIN

Which Tissue?

Blood, saliva, cheek cells, or brain after death. A difference in blood tells you about blood.

STRONG

HOW BIG

A Few Clips or Many?

Often a few percentage points of methylation at a handful of sites. No size given? Be wary.

MODERATE

CAUSE OR COMPANY

Experiment or Link?

Did anyone change something and watch, as when the rat litters were swapped? Together is not because.

STRONG

YOUR FILTER: TICK EACH QUESTION A HEADLINE PASSES

#	HEADLINE	WHO	TISSUE	SIZE	CAUSE	PASSES / WAITS
1						
2						
3						
4						

Passes all four: it deserves your attention. Fails two or more: it can wait.

IF YOU CARE FOR A BABY MODERATE

In premature and low-birth-weight babies, skin-to-skin contact, known as kangaroo care, reduces infections and mortality compared with conventional care, according to a review of more than twenty trials. For full-term babies, holding, rocking, and responding when they cry is ordinary good care; whether it leaves a trace on methylation is an open question, and you do not need the answer to do it.

NOTES



PART II · CHAPTER 5

The Hunger Winter

THE CHAPTER IN THREE LINES

The Hunger Winter of 1944-45 gave science a cruel and exact natural experiment: a known famine with a known beginning and end.

What mattered most was timing: hunger during the first pass of underlining, at the start of pregnancy, left marks in the blood that could still be read sixty years later.

Those marks describe small average shifts between groups, not a sentence on any one life.

IN THIS WORKBOOK Practice · Your First Chapter

CHAPTER 5 · PRACTICE

Your First Chapter

A phone call or a look in a drawer, in a house with a yard or a small apartment. It is about the first chapter of your own story, the one you cannot remember.

1



YOUR BEGINNING

Find Your Birth Weight

And how many weeks you were born at. It is often in the health booklet you were given as a baby.

STRONG

2



NOT A VERDICT

Tell Your Doctor

If you weighed under about 5.5 lb (2.5 kg) at full term, or were born very early, keep an eye on blood pressure, sugar, and fats.

MODERATE

3



WHAT HELPS EVERYONE

Move, Sleep, Don't Smoke

And eat real food. There is no special diet for people with a hard beginning.

STRONG

4



A PREGNANCY NEARBY

Folic Acid and a Hand

Folic acid before conception; a hand with the shopping, a meal, a worry taken on.

STRONG · PRELIMINARY

THE FIRST MEASUREMENT ANYONE TOOK OF YOU

BIRTH WEIGHT
lb / oz or grams

WEEKS OF PREGNANCY
term is 37 weeks or more

WHERE I FOUND IT
booklet, parent, record

TWO DEFINITIONS STRONG

Low birth weight: under 2,500 g (5.5 lb), whatever the length of the pregnancy. **Preterm:** born before 37 completed weeks. They are not the same thing. In 2020, about one baby in seven worldwide was born under 2,500 g.

FOLIC ACID STRONG

For anyone who may become pregnant, a daily folic acid supplement started before conception sharply reduces the risk of neural tube defects (by 72 percent in the trial that settled it). Pregnancy is no time for strict diets.

Adopted, or nobody kept the record? Skip step 1: the rest works without it.



PART II · CHAPTER 6

What Is Passed On, and What Is Not

THE CHAPTER IN THREE LINES

A family reaches you by four roads: genes, the womb, upbringing and family culture, and, possibly, marks in eggs and sperm.

The first three are well established; the fourth has been seen in mice, but in humans it has not been shown, because nearly all marks are wiped on the way to the next generation.

The children and grandchildren of Holocaust survivors show, as a group, a resilience that the word “inherited trauma” hides, and the road you can change most is the one that runs through the home.

IN THIS WORKBOOK Practice · Draw Your Four-Road Tree

Draw Your Four-Road Tree

About twenty minutes and a sheet of paper. You do not need to know your whole family history, and you do not need to share it with anyone. Start with three rows: you at the bottom, the people who raised you above, and the generation before them at the top. Gaps are part of most family trees.

1



THE THREAD

Genes

A continuous line from your biological parents and grandparents. Half from each parent, a different half for each child.

STRONG

2



THE ARROW

The Womb

A short, broad arrow from the woman who carried you. A word, if you know one, about that pregnancy.

MODERATE

3



THE HOUSE

Upbringing

Arrows from everyone who raised you and shaped your home. Habits, comfort, and silences; it can change at any point.

STRONG

4



THE DOTTED LINE

Eggs and Sperm

A faint dotted line from your grandparents: seen in mice, not shown in people.

UNSUPPORTED · IN HUMANS

THE ARROWS THAT LEAVE FROM YOU

The thread of genes is already fixed. The arrows of the house are not: they run from you to anyone you look after, children, nephews and nieces, a younger colleague, a friend in a hard year.

ADOPTED, OR RECORDS LOST?

If your family was scattered by migration or war, the first two rows may be mostly empty. The practice still works: the arrows of the house were drawn by whoever cared for you.

NOTES

CHAPTER 6 · WORKSHEET

Your Tree

Fill in the boxes you know and leave the rest empty. Then draw the four roads with the marks below.

— Thread
Genes: solid line from biological family

➜ Womb
Short, broad arrow from who carried you

→ House
Arrows from whoever raised you. Circle what to keep

– Dotted
“Seen in mice; not shown in people”

Grandparent / elder

Grandparent / elder

Grandparent / elder

Grandparent / elder

Raised me

Raised me

Raised me

ME

NOTES

PART III

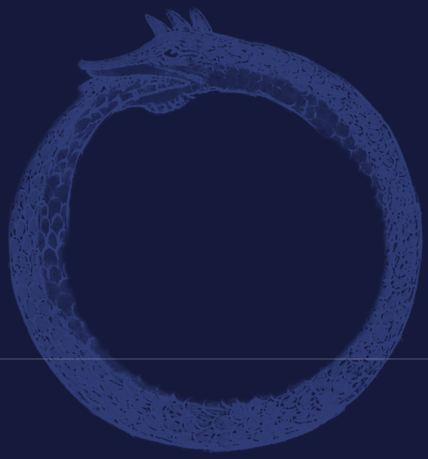
The Body's Clocks

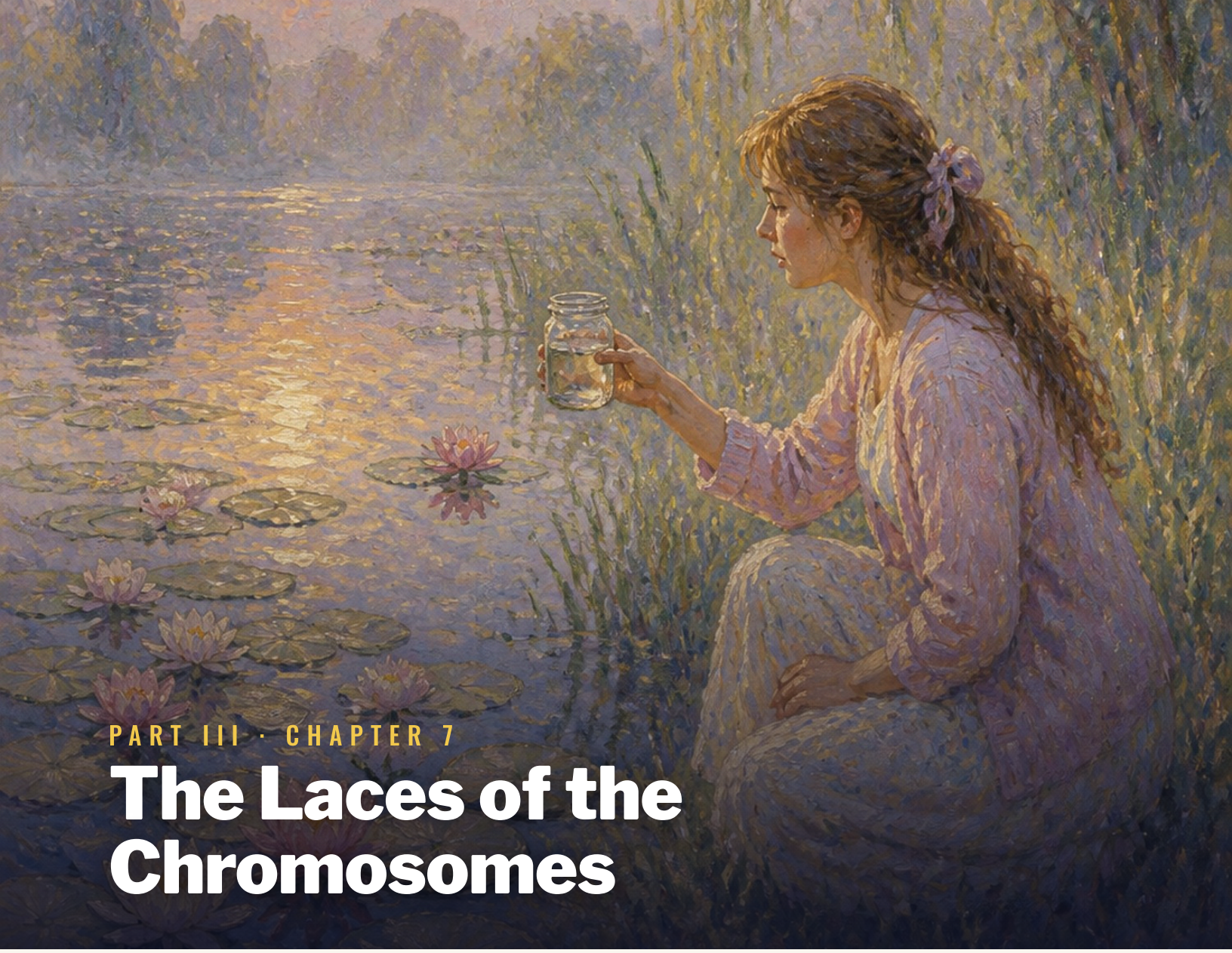
The two ways scientists now measure aging in cells: telomeres, the tips that wear down, and the epigenetic clocks that read age from DNA.

7 The Laces of the Chromosomes

8 The Wear of Caring

9 Horvath's Clock





PART III · CHAPTER 7

The Laces of the Chromosomes

THE CHAPTER IN THREE LINES

Each of your chromosomes ends in a telomere, thousands of letters of TTAGGG repeated like the plastic tip of a lace, which shortens a little with many cell divisions and protects the genes inside.

Telomerase, discovered by Carol Greider and Elizabeth Blackburn on Christmas Day 1984, rebuilds those tips by copying its own RNA template; your body keeps it switched off in most cells, partly as a brake on cancer.

People are born with very different telomere lengths, and no pill has been shown to lengthen them in a way that improves health; what living does to them is the subject of the next chapter.

IN THIS WORKBOOK Practice · A Paper Chromosome · Plate 12 · The End of the Chromosome

A Paper Chromosome

You cannot see your telomeres, but you can build a model of what happens to them in five minutes, with a strip of paper and scissors. It is a good way to explain this chapter to a child. The model shows the logic, not the real sizes: on a strip a foot long, a real telomere would be thinner than the line your pen draws.

1



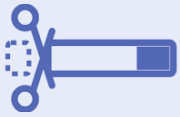
WRITE

Make the Chromosome

A sentence in the middle: the gene. END written eight times at each tip: the telomeres.

STRONG

2



DIVIDE

Cut One Word

Each division, cut one END from one tip, alternating ends. That is the end-replication problem.

STRONG

3



COUNT

Stop at the Gene

When a cut would reach your sentence, stop. That is the Hayflick limit: the cell stops.

STRONG · IN CELLS

4



TELOMERASE

Write It Back

On a new strip, write one END back after every cut. Then ask who should be allowed to.

STRONG

WHO WRITES IT BACK STRONG

In your body, telomerase works in egg and sperm cells, in the early embryo, and at a low level in some stem cells. Most cancers switch it back on. Real telomeres are TTAGGG repeated hundreds to thousands of times.

TO TAKE WITH YOU

Your sentence was never touched while the telomeres lasted. That is the job of the aglet: to wear out so that what matters does not.

YOUR COUNT

Divisions before the cut reached the sentence: _____

With telomerase, divisions until I ran out of paper: _____

Three Paper Chromosomes

Print, cut along the dashed lines, and write your sentence in the middle. The third strip has blank tips for your telomerase round.

END END END END END END END END write your sentence here: the gene END END END END END END END END

✂ cut along the dashed line

END END END END END END END END write your sentence here: the gene END END END END END END END END

✂ cut along the dashed line

telomerase round: write END back after every cut

✂ cut along the dashed line

DIVISION	ENDS LEFT, LEFT TIP	ENDS LEFT, RIGHT TIP	SENTENCE INTACT?
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

NOTES



PART III · CHAPTER 8

The Wear of Caring

THE CHAPTER IN THREE LINES

In 2004, mothers who felt their lives as most stressful, and those who had been caring the longest, had shorter telomeres in their white blood cells; being a caregiver on its own made no difference.

Twenty years of studies show that everyday stress leaves only a faint trace on telomeres, while severe, long, or early adversity leaves a clearer one.

Telomere length is a crude gauge for comparing groups, not a personal score: longer is not always better, and a commercial test cannot tell you your real age.

IN THIS WORKBOOK Practice · Lighten What You Can

CHAPTER 8 · PRACTICE

Lighten What You Can

For anyone who carries a heavy load for a long time, caring for someone or something else. It promises nothing for your telomeres; there are no trials that show that. It aims at the part of the load that can be made lighter, with approaches that have good evidence for how people feel and function.

1



THE PAST MONTH

Measure Your Load

Perceived Stress Scale: ten questions about the past four weeks, scored 0 to 40. Your doctor or a psychologist can give it to you.

STRONG · AS A TOOL

2



EVERY DAY

One Thing That Is Yours

Twenty minutes with a book, a call to a friend, a coffee by the window. On the calendar, like an appointment.

MODERATE

3



MOST DAYS

Get Out of Breath

A brisk walk, the stairs of your building, a few songs danced in the living room.

PRELIMINARY · TELOMERES

4



AFTER 4 WEEKS

Measure Again

Compare. If it has not moved, change one thing in step 2 or 3, and keep going.

STRONG · AS A TOOL

WHY STEP 2 WORKS MODERATE

Putting small, valued things on the calendar is the core of behavioral activation. In twelve trials with family caregivers it reduced symptoms of depression, with effects still visible a year later.

TWO NOTES, SAID GENTLY

If your score stays high, or you have stopped enjoying almost everything, talk to your doctor: caregivers have a higher risk of depression, and that is not a weakness. And if someone offers to take over for an afternoon, say yes.

NOTES

CHAPTER 8 · WORKSHEET

Your Four Weeks

Write your one thing in each day. Tick the first box when you did it, the second when you got out of breath.

WEEK 0 · STRESS SCORE

0 to 40 · date _____

WEEK 4 · STRESS SCORE

0 to 40 · date _____

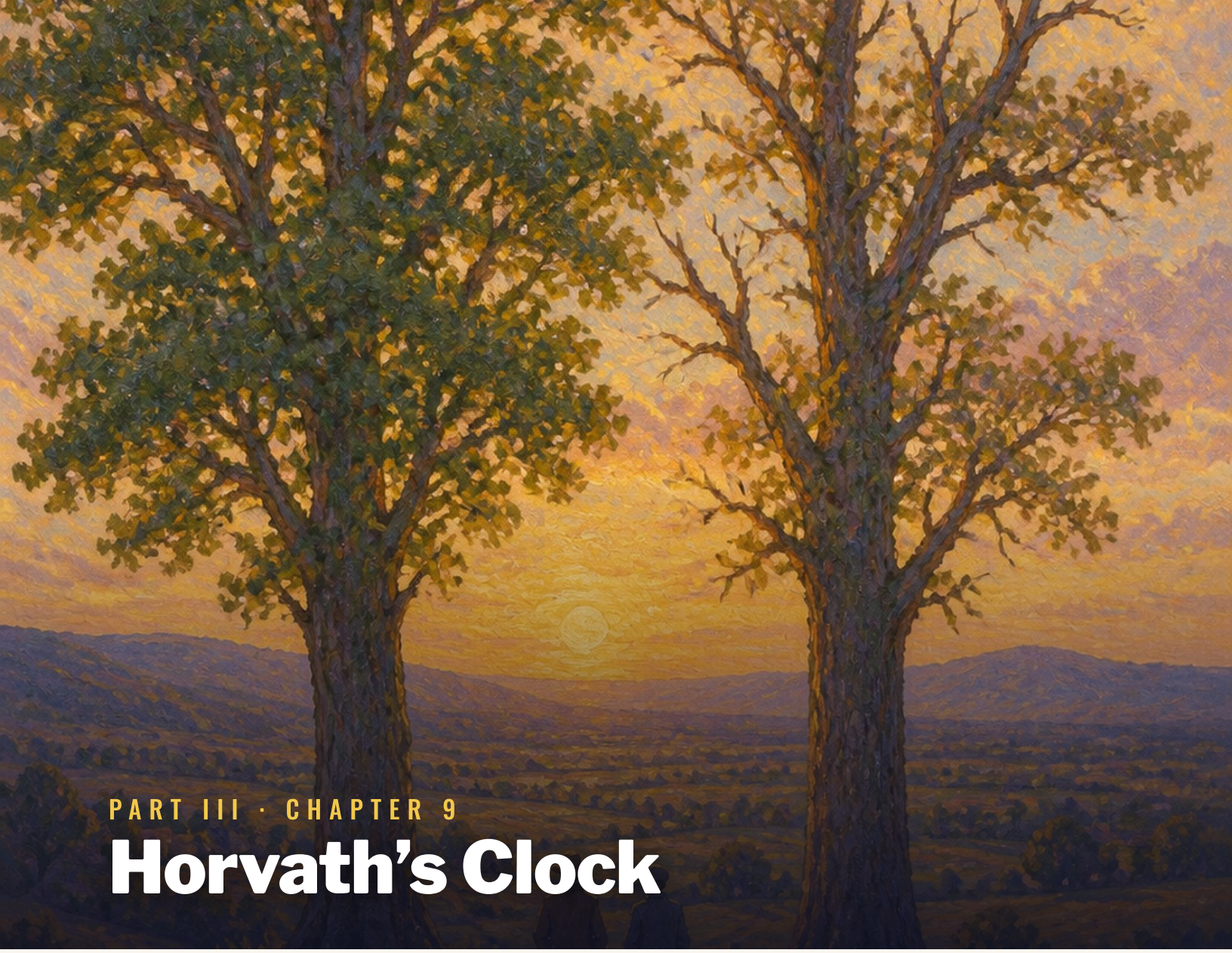
WHAT I WILL CHANGE

if it has not moved

1 ☐☐	2 ☐☐	3 ☐☐	4 ☐☐	5 ☐☐	6 ☐☐	7 ☐☐
8 ☐☐	9 ☐☐	10 ☐☐	11 ☐☐	12 ☐☐	13 ☐☐	14 ☐☐
15 ☐☐	16 ☐☐	17 ☐☐	18 ☐☐	19 ☐☐	20 ☐☐	21 ☐☐
22 ☐☐	23 ☐☐	24 ☐☐	25 ☐☐	26 ☐☐	27 ☐☐	28 ☐☐

☐ my thing ☐ out of breath

NOTES



PART III · CHAPTER 9

Horvath's Clock

THE CHAPTER IN THREE LINES

Your cells keep time in the pattern of methyl clips on their DNA, and a clock built from 353 of those sites reads age across almost every tissue to within a few years.

A clock that runs ahead of your real age goes with higher health risks; stress, childhood threat, smoking, and metabolic illness tend to speed it up, and recovery lets it settle.

Two randomized trials have slowed the pace of aging a little; no test yet tells you your individual future, and no product has been shown to rewind your clock.

IN THIS WORKBOOK Try It at Home · Guess the Age | Practice · Set Your Pace, Not Your Number

Guess the Age

An epigenetic clock is, at heart, a well-trained eye looking at a photo and naming an age; only the photo is a map of clips on DNA. Build your own clock in an afternoon with the family album, and see the two things that matter about any clock: how wrong it is, and what it means when it is wrong.

WHAT YOU NEED

- [ ] Ten photos of adults of known exact age (who do not mind)
- [ ] Three people who do not know those ages
- [ ] Paper and a calculator

1



GATHER

Ten Photos

Adults whose exact age on the day of the photo you know, from 20 to 80 if you can.

STRONG

2



GUESS

Three Judges

No hints. Average their three answers: that is the "perceived age."

STRONG

3



CALCULATE

Your Error

Perceived minus real. Ignore the sign and average the ten: your clock's error. Horvath's missed by 3.6 years.

STRONG

4



WHAT IS LEFT

Looking Older

In 1,826 Danish twins over 70, the older-looking twin tended to die first.

MODERATE

WHAT HAPPENED AT THE TABLE

Your homemade clock will usually be several years out. A clock is a prediction with a margin of error, and the margin is the first thing to ask about. The interesting part is what is left over: how far the guess strays from the calendar.

BE KIND

Nobody likes to hear they look ten years older: no need to read results aloud. Ten photos and three judges predict nothing about anyone.

NOTES

CHAPTER 9 · LOGGING SHEET

Your Clock

Difference = perceived age minus real age. Positive: looks older. Negative: looks younger.

PHOTO	REAL AGE	JUDGE 1	JUDGE 2	JUDGE 3	PERCEIVED (AVG)	DIFFERENCE	SIZE (NO SIGN)
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

YOUR CLOCK'S ERROR

average of the last column

_____ years

HORVATH'S CLOCK

median error on new samples

3.6 years

WHAT SURPRISED YOU

NOTES

CHAPTER 9 · PRACTICE

Set Your Pace, Not Your Number

No test to buy. Look at the few things that, as far as we know, move the clock, and choose one. Nothing here needs more room than a kitchen table.

1



THE SLOW LEVERS

Habits

No smoking, healthy blood sugar and waist, plenty of vegetables and fruit. Pick the one with most room.

MODERATE

2



THE ENDING

Recovery

Close one strain this week: a postponed talk, a noise you can block, an evening without screens.

PRELIMINARY

3



THE PLATE

Enough

If you often eat past full, eat a little less. Not if pregnant, underweight, growing, or with a history of eating disorders.

MODERATE

4



THE FORECAST

Test Twice

If you buy a test: same company, same clock, repeat in six months to a year.

STRONG

MY CARD FOR THIS MONTH

Card: _____

What I will do, and when: _____

How I will know I did it: _____

Your text is fixed. The pace at which it ages is, in part, still being written. The clock moves slowly; so does this practice.

NOTES

PART IV

The Environment Under the Skin

Green space, light, and noise, one by one: how each reaches the body, how strong the evidence is, and what you can change in a city apartment.

10 The Window

11 Two Months Without the Sun

12 Noise and the City





PART IV · CHAPTER 10

The Window

THE CHAPTER IN THREE LINES

People who see or live near more green tend to recover from stress faster, and some of that effect travels from the eye to the stress axis and to cortisol.

Cortisol reaches the nucleus through its receptor and lands right where the epigenetic clocks are read; studies of many people link more green to clocks running a year or so slower, though cause is not yet proven.

The benefit is not the same for everyone: it seems larger for people with fewer resources and, in the first studies, for more sensitive people.

IN THIS WORKBOOK Try It at Home · Three Experiments · Practice · Your Dose of Green

Audio 2 · *The Listening Walk*

Three Experiments

No laboratory: a watch, a notebook, and a little patience. None of these measures your epigenetic clock, and one person's results prove nothing about anyone else. But you will see, in your own body and on your own street, the kind of effect the studies describe.

1



PULSE AND CALM

Your Measure

Two fingers inside the wrist, 60 full seconds. Calm from 1 (very tense) to 10 (completely calm).

STRONG

2



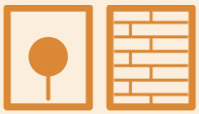
TWO WALKS

Park and Street

30 to 60 minutes each, same time of day. Pulse and calm before and after. Repeat next week in the opposite order.

PRELIMINARY

3



THE WINDOW

Trees or a Wall

Three minutes counting back from 1,000 by 7s, out loud. Then six minutes looking at trees. Another day, a wall.

MODERATE

4



GREEN MAP

500 Meters

On a free satellite map, how much of a 500-meter circle around home is trees? Then your daily route.

PRELIMINARY · ASSOCIATION

IF THE PULSE BARELY MOVES MODERATE

The large 2026 repetition of the window test found that mood recovered clearly better with nature, while the pulse changed little. If your notebook shows the same, it is not a failure: it is what the best data say.

3-30-300 PRELIMINARY

A rule of thumb: three trees visible from home, 30 percent canopy in your neighborhood, no more than 300 meters (1,000 feet) to the nearest park. In Barcelona only 4.7 percent of residents met a version of all three.

NOTES

CHAPTER 10 · LOGGING SHEET

Your Three Experiments

1 · TWO WALKS

WALK	DATE	MINUTES	PULSE BEFORE	CALM BEFORE	PULSE AFTER	CALM AFTER
WEEK 1						
Park						
Street						
WEEK 2 · OPPOSITE ORDER						
Street						
Park						

2 · THE WINDOW TEST

MOMENT	DATE	PULSE	CALM (START AND END)	NOTES
TREES				
Start				
3 min				
6 min				
WALL OR STREET				
Start				
3 min				
6 min				

3 · YOUR GREEN MAP

Tick one per row.

PLACE	ALMOST NONE	A QUARTER	HALF	MORE THAN HALF
500 m around home				
My daily route				
A greener variant				

3-30-300 check: ☐ 3 trees from my window ☐ 30% canopy ☐ park within 300 m

Your Dose of Green

Audio 2 · *The Listening Walk*

The best guide to how much green is enough comes from 19,806 people in England: those who spent at least 120 minutes in nature in the previous week were more likely to report good health and well-being, and the benefit leveled off between 200 and 300 minutes. One long walk or several short ones made no difference. It is a survey, not a trial, but it gives you a target: less than twenty minutes a day.

1



NEAREST GREEN

Find Your Green

A park, a tree-lined street, a riverbank, a cemetery with old trees: all count. And the route with the most trees.

MODERATE

2



120 MIN A WEEK

Add Up Two Hours

Short stretches add up. Write the minutes down: most people overestimate them.

MODERATE · ASSOCIATION

3



AT THE WINDOW

Can't Go Out? Look Out

Move your chair or desk to face a tree, a patch of sky, or even a single plant.

PRELIMINARY

4



BEFORE AND AFTER

Notice How You Feel

One line after each dose, from one to ten, for two weeks.

PRELIMINARY

WHAT TO EXPECT

A calmer head and a lower heart rate after a green walk are well documented in the short term. What happens to your clocks over years has been seen only on average, across many people, and nobody can measure it in you after two weeks. Do it for the first reason; the second, if it comes, is a bonus.

NOTES

CHAPTER 10 · LOGGING SHEET

Two Weeks of Green

Target: 120 minutes a week, in any combination. Feeling from 1 to 10.

DAY	WHERE	MINUTES	RUNNING TOTAL	BEFORE	AFTER	ONE LINE
WEEK 1						
Mon						
Tue						
Wed						
Thu						
Fri						
Sat						
Sun						
WEEK 2						
Mon						
Tue						
Wed						
Thu						
Fri						
Sat						
Sun						

NOTES



PART IV · CHAPTER 11

Two Months Without the Sun

THE CHAPTER IN THREE LINES

Inside almost every cell you carry a clock made of genes that switch each other on and off over about a day, and that opens and closes the chromatin as it goes.

Light, through special cells in the retina, resets that clock every morning; light in the evening pushes it later.

Everyone's clock listens to light, but the dose that moves it differs more than fiftyfold between people.

IN THIS WORKBOOK Try It at Home · The Sleeping Beans · Practice · Light on Your Side

Audios 2 & 3 · *Morning and evening*

The Sleeping Beans

In 1729 Jean-Jacques d'Ortous de Mairan put a mimosa in a cabinet. In the dark it went on opening and closing its leaves on time: the first experiment on the inner clock of a living thing. You can repeat it with a pot of beans.

WHAT YOU NEED

- [ ] Two or three bean seeds in a pot
- [ ] A small lamp you can leave on
- [ ] Your phone
- [ ] A room with no outside light (an inside bathroom will do)
- [ ] White cardstock and a marker

1



SOW

Two Open Leaves

About two weeks in a pot, until each plant opens its first two leaves.

STRONG

2



WATCH

Awake and Asleep

By day the leaves are nearly flat; at night they hang down, as if asleep.

STRONG

3



STEADY LIGHT

No Day, No Night

A windowless room, a lamp left on day and night, a card with three lines behind the plant.

STRONG

4



PHOTOGRAPH

Still Moving

Every two or three hours while you are awake, for three days. Mark the line the leaf tip reaches.

STRONG

WHAT HAPPENED IN THE POT STRONG

With no day and no night, the plant keeps raising and lowering its leaves roughly once a day: a clock inside. And in constant light the cycle is not exactly 24 hours, so by day three the leaves sleep at a slightly different time, as Siffre's clock did underground.

IF IT FADES

The movement fades over the days, because the plant has little light. If by day four you see nothing clear, put it back on the windowsill: no harm done.

Your Notebook: The Sleeping Beans

One row per photo. Tick the line the leaf tip reaches. Lamp on day and night, no outside light.

TIME	TOP	MIDDLE	BOTTOM	NOTES
DAY 1				
DAY 2				
DAY 3				

VARIATION: YOUR OWN CURVE

Temperature under the tongue every two hours for one day. Not within 30 minutes of eating, drinking, showering, or exercise. Usually coolest on waking, warmest in the late afternoon, less than one degree apart.

ON WAKING	+2 H	+4 H	+6 H	+8 H	+10 H	+12 H	BEFORE BED

NOTES

CHAPTER 11 · PRACTICE

Light on Your Side

Step 1 · *The Listening Walk*

Steps 2–4 · *Lights Down*

No equipment and no money. It works in a house with a yard and in a small apartment facing an inner courtyard. Try it for two weeks and notice how you fall asleep, how you wake up, and how you feel in the middle of the afternoon.



A Two-Week Test

Week 1: your usual evenings. Week 2: steps 2 to 4. Each morning, fill in one row.

Rested: 1 = not at all · 5 = fully

DAY	DAYLIGHT IN FIRST HOUR (MIN)	OVERHEAD LIGHTS OFF AT	FELL ASLEEP ABOUT	RESTED (1–5)
WEEK 1 · USUAL EVENINGS				
Mon				① ② ③ ④ ⑤
Tue				① ② ③ ④ ⑤
Wed				① ② ③ ④ ⑤
Thu				① ② ③ ④ ⑤
Fri				① ② ③ ④ ⑤
Sat				① ② ③ ④ ⑤
Sun				① ② ③ ④ ⑤
WEEK 2 · STEPS 2 TO 4				
Mon				① ② ③ ④ ⑤
Tue				① ② ③ ④ ⑤
Wed				① ② ③ ④ ⑤
Thu				① ② ③ ④ ⑤
Fri				① ② ③ ④ ⑤
Sat				① ② ③ ④ ⑤
Sun				① ② ③ ④ ⑤

It is not a laboratory measurement, but it is a fair comparison with yourself. If you work nights, adapt it with an occupational health service: dark when your body must sleep, light when it must be awake.



PART IV · CHAPTER 12

Noise and the City

THE CHAPTER IN THREE LINES

Sound becomes electricity in your ear within microseconds, and through the amygdala, adrenaline, and cortisol it can reach the nucleus of your cells and change which genes are read.

At night, your mind gets used to noise but your heart keeps answering it; in children, chronic noise slows reading, and taking the noise away gives the reading back.

Whether noise speeds up the molecular clocks of aging in people is not yet known; what is known is enough to protect the place where you sleep, especially if you are sensitive to noise.

IN THIS WORKBOOK Try It at Home · Record Your Night · Practice · Less Noise

Audio 4 · *The Quiet Room*

Record Your Night

Audio 4 · *The Quiet Room*

By day you know what bothers you. At night you do not, and yet night is when noise does most of its work. Hear what your ears hear while you are not listening.



RECORD

Phone by the Bed

On charge, screen down, microphone facing the room, a sound-meter app logging all night.

MODERATE

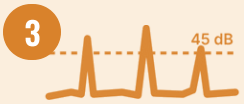


RATE

Before You Look

In the morning, how you slept from 1 to 10, before you open the graph.

MODERATE



COUNT

The Peaks

Sudden rises above 45 decibels. Note the loudest and, if the app kept it, listen to what it was.

MODERATE



REPEAT

Three Nights

A weeknight and a weekend, or the window open and the window shut.

MODERATE

THREE NIGHTS

NIGHT	DATE · WINDOW	SLEPT (1–10)	PEAKS > 45 DB	LOUDEST: TIME	WHAT IT WAS
1					
2					
3					

WHAT YOU WILL PROBABLY FIND MODERATE

Your night is not a level but a handful of events: the motorcycle at two, the garbage truck, a neighbor's door. The average looks quiet even with ten jolts in it, and your mind gets used to noise before your body does.

FAIR AND PRIVATE

Apps came within about 2 dB of a professional meter in tests with loud noise: compare nights on the same phone. Tell anyone who shares the room, and delete the recordings when you finish.

NOTES

Less Noise

Audio 4 · *The Quiet Room*

Designed for a city apartment, because that is where most noise lives. No yard, no park, no money for new windows needed to start. Give it two weeks.

1



ONE WEEK

Find Your Noise

What you hear and when, especially evening and night. Watch the peaks, not the average.

MODERATE

2



EVERY NIGHT

Protect the Bedroom

The quiet side, the window shut, gaps checked, foam earplugs. No all-night white noise.

MODERATE

3



EVERY DAY

A Stretch of Quiet

Twenty minutes in the quietest place you can reach: a back room, a library, a far bench.

PRELIMINARY

4



CHECK ONCE

Your Children's Rooms

Which side their bedroom faces, and how noisy their school is.

MODERATE

FITTING A FOAM EARPLUG STRONG

Roll it thin between your fingers. Pull the top of your ear up and back. Slide it in and hold it with a fingertip while it expands, about ten seconds. Fitted well, only a small part shows.

WHITE NOISE MACHINES UNSUPPORTED

A systematic review found the evidence that they help sleep very weak, and some studies suggest they can make it worse. If you use one, keep it quiet and away from your head.

NOTES

CHAPTER 12 · LOGGING SHEET

Your Noise Week

Short notes are enough: the bus at the stop, the trash pickup at five, the neighbor's TV.

DAY	EVENING: WHAT AND WHEN	NIGHT: WHAT AND WHEN	PEAK OR STEADY?	CAN I CHANGE IT?
Mon				
Tue				
Wed				
Thu				
Fri				
Sat				
Sun				

AFTER TWO WEEKS: THE FEW SOUNDS THAT CAUSE MOST OF THE TROUBLE

THE ONE OR TWO I CAN DEAL WITH

NOTES

PART V

Orchids

Sensitivity back at the center: why the same dial turns up the bad and the good, and what has real support when you set out to shape your own surroundings.

13 The Worst and the Best

14 Building Your Surroundings





PART V · CHAPTER 13

The Worst and the Best

THE CHAPTER IN THREE LINES

Sensitivity works like a volume dial: it makes a bad environment worse and a good one better, and the crossing of those two lines is the signature of differential susceptibility.

People are not orchids or dandelions; sensitivity is spread along a smooth curve, partly inherited and spread across thousands of genes, and no test can read it yet.

You do not choose your dial, but you have a hand on what is playing, and the higher your dial, the more that hand matters.

IN THIS WORKBOOK · Try It at Home · The Same Noise for Everyone · Practice · Your Two-Column Week

The Same Noise for Everyone

It is easy to say that everyone reacts differently. It is another thing to see it at the same table, with the same sound, in the same minute. Five minutes; better the more people there are.



IN SECRET

A Slip Each

Paper and pen for each person, from about eight years old. Nobody shows their score until the end.

MODERATE



THE NOISE

How Much It Grates

One minute of vacuum cleaner or blender at household volume. Score 0 to 10.

MODERATE



THE MUSIC

How Much It Moves

After a short rest, one minute of a song or birdsong. Another score, 0 to 10.

PRELIMINARY



IN A LINE

One Single Curve

Line up the noise scores: most in the middle, someone at each end, no two camps.

MODERATE

THE TABLE'S SCORES

#	NAME (OPTIONAL)	NOISE 0–10	MUSIC 0–10	SAME END ON BOTH?
1				
2				
3				
4				
5				
6				
7				
8				

WHAT HAPPENED AT THE TABLE MODERATE

The scores usually spread along the whole line, with no clean split into two camps: a tiny version of what Zhang, Widaman, and Belsky found in 2023 with more than 1,300 children. Is the person who scored the noise highest also the one most moved by the music? In large studies, sometimes yes and sometimes no.

NOBODY LAUGHS

The person who is always told they overreact is simply at another point on the curve. Household volume only; stop at once if anyone finds it truly unpleasant.

CHAPTER 13 · PRACTICE

Your Two-Column Week

This borrows the design of the study in this chapter: a few seconds, five times a day, for seven days, anywhere. The aim is to see your own dial at work: what turns the noise up for you, and what turns the good up.

1



FIVE A DAY

Set Five Reminders

For example 10 a.m. and 1, 4, 7, and 9 p.m. How overstimulated you feel, from 0 to 10.

PRELIMINARY

2



FOUR WORDS

Note What Is Around

What you hear, what you see, who is around you, how tired you are.

PRELIMINARY

3



TWO COLUMNS

Split the Page

High numbers to “What turned it up,” low numbers to “What helped.” Look for repeats.

PRELIMINARY

4



ONE OF EACH

Change One Thing

Reduce one item on the left; add one from the right. Not five; one of each.

PRELIMINARY

TIRED AND MOOD

In the study, tiredness and mood were among the strongest switches for sensitive people, in both directions. If your right column fills with “rested” and your left with “exhausted,” that is your dial telling you where it sits.

WHAT THIS IS

A way of observing yourself, built on one study of 139 adults. Not a test, not a diagnosis. It replaces “everything gets to me” with a short list of what does, and a short list of what helps.

NOTES

CHAPTER 13 · WORKSHEET

Thirty-Five Check-Ins

At each reminder: a number from 0 to 10, and four words.

DAY	10 A.M.	1 P.M.	4 P.M.	7 P.M.	9 P.M.
Mon	0–10: ___ hear · see who · tired	0–10: ___ hear · see who · tired	0–10: ___ hear · see who · tired	0–10: ___ hear · see who · tired	0–10: ___ hear · see who · tired
Tue	0–10: ___ hear · see who · tired	0–10: ___ hear · see who · tired	0–10: ___ hear · see who · tired	0–10: ___ hear · see who · tired	0–10: ___ hear · see who · tired
Wed	0–10: ___ hear · see who · tired	0–10: ___ hear · see who · tired	0–10: ___ hear · see who · tired	0–10: ___ hear · see who · tired	0–10: ___ hear · see who · tired
Thu	0–10: ___ hear · see who · tired	0–10: ___ hear · see who · tired	0–10: ___ hear · see who · tired	0–10: ___ hear · see who · tired	0–10: ___ hear · see who · tired
Fri	0–10: ___ hear · see who · tired	0–10: ___ hear · see who · tired	0–10: ___ hear · see who · tired	0–10: ___ hear · see who · tired	0–10: ___ hear · see who · tired
Sat	0–10: ___ hear · see who · tired	0–10: ___ hear · see who · tired	0–10: ___ hear · see who · tired	0–10: ___ hear · see who · tired	0–10: ___ hear · see who · tired
Sun	0–10: ___ hear · see who · tired	0–10: ___ hear · see who · tired	0–10: ___ hear · see who · tired	0–10: ___ hear · see who · tired	0–10: ___ hear · see who · tired

NOTES

CHAPTER 13 · WORKSHEET

Split the Page

Copy every high number to the left and every low number to the right, with its four words. Circle the words that repeat.

WHAT TURNED IT UP

WHAT HELPED

NEXT WEEK I WILL REDUCE

NEXT WEEK I WILL ADD

NOTES



PART V · CHAPTER 14

Building Your Surroundings

THE CHAPTER IN THREE LINES

Bright days and dark nights, quiet sleep, some green each week, and people you trust have the best support, and most of them are cheap or free.

The evidence is strongest for light, moderate for green and company, and still preliminary for many of the fixes sold in stores.

Your sensitivity decides your fit, so change one thing at a time, and keep what works for you.

IN THIS WORKBOOK Practice · A Week to Tune Your Surroundings

Audio 3 · *Lights Down*

A Week to Tune Your Surroundings

Audio 3 · *Lights Down*

The last practice of the book gathers the others. One week, almost no cost, a small apartment or a house with a yard. The rule is Nightingale's: one change at a time, and pay attention to how you respond.

BEFORE YOU START

Spend one evening noticing. At the hour you usually go to bed, ask four questions in each room: how bright is it, what can I hear, what can I see from here, and who do I share this space with? Use the home audit on page 65. If you kept your dial list from Chapter 3, put it beside tonight's notes: it tells you where to begin.

1



LIGHT

Bright Mornings, Dark Nights

Outside within two hours of waking, 15 minutes or more. Overhead lights off two or three hours before bed.

MODERATE

2



QUIET

Protect Your Sleep

Day 4: the quietest room, the bed on the far wall, no alerts at night, foam earplugs if needed.

PRELIMINARY

3



GREEN

Two Hours a Week

120 minutes in green or blue places, in any combination, even a tree-lined street.

MODERATE

4



PEOPLE

One Unhurried Talk

Someone you trust, no screens on the table. A walk together counts twice.

MODERATE

AT THE END OF THE WEEK

Which change made the most difference to how you slept and felt? Keep that one. Add the next only when the first is a habit. If nothing changed, that is information too: your dose and your fit are your own.

TWO NOTES OF CARE

If your sleep, mood, or sensitivity to noise or light has changed suddenly, see a doctor: these can have medical causes no lamp will fix. Thinking of a light box for winter? Talk to a professional first, especially with bipolar disorder or an eye condition.

NOTES

CHAPTER 14 · LOGGING SHEET

Your Tuning Week

Tick what you did; score sleep and feeling from 1 to 10 the next morning.

DAY	MORNING LIGHT ≥15 MIN	LAMPS LOW AFTER DUSK	QUIET ROOM · ALERTS OFF	GREEN MINUTES	UNHURRIED TALK	SLEPT 1–10	FELT 1–10
Day 1							
Day 2							
Day 3							
Day 4							
Day 5							
Day 6							
Day 7							

THE CHANGE THAT MADE THE MOST DIFFERENCE

THE NEXT ONE, WHEN THE FIRST IS A HABIT

NOTES

BEYOND THE BOOK

Four New Exercises

These pages are not in the book. They take what the chapters showed you and turn it toward the place where you actually live: your rooms, your days, your own dial, and the headlines that keep arriving.

A — A Home Audit, Room by Room

B — Your Sensitivity Map

C — The Headline Card

D — A Thirty-Day Plan



BEYOND THE BOOK · A

A Home Audit, Room by Room

Audio 3 · *Lights Down*

Florence Nightingale took the measure of a hospital ward before she changed anything in it. Do the same with your home, at the hour you usually go to bed. You are not judging it; you are taking its measure. This is the "before you start" of Chapter 14, with room to write.

Bedroom

score 1–5: ☐ ☐ ☐ ☐ ☐

LIGHT	SOUND	VIEW	PEOPLE
How bright now? Overhead on? Screens?	What can I hear? Steady or peaks?	Sky, tree, plant, or wall?	Who shares it? Fuller or emptier?

Living room

score 1–5: ☐ ☐ ☐ ☐ ☐

LIGHT	SOUND	VIEW	PEOPLE
How bright now? Overhead on? Screens?	What can I hear? Steady or peaks?	Sky, tree, plant, or wall?	Who shares it? Fuller or emptier?

Kitchen

score 1–5: ☐ ☐ ☐ ☐ ☐

LIGHT	SOUND	VIEW	PEOPLE
How bright now? Overhead on? Screens?	What can I hear? Steady or peaks?	Sky, tree, plant, or wall?	Who shares it? Fuller or emptier?

Where I work or study

score 1–5: ☐ ☐ ☐ ☐ ☐

LIGHT	SOUND	VIEW	PEOPLE
How bright now? Overhead on? Screens?	What can I hear? Steady or peaks?	Sky, tree, plant, or wall?	Who shares it? Fuller or emptier?

Bathroom / hallway

score 1–5: ☐ ☐ ☐ ☐ ☐

LIGHT	SOUND	VIEW	PEOPLE
How bright now? Overhead on? Screens?	What can I hear? Steady or peaks?	Sky, tree, plant, or wall?	Who shares it? Fuller or emptier?

Another room: ____

score 1–5: ☐ ☐ ☐ ☐ ☐

LIGHT	SOUND	VIEW	PEOPLE
How bright now? Overhead on? Screens?	What can I hear? Steady or peaks?	Sky, tree, plant, or wall?	Who shares it? Fuller or emptier?

THE ROOM THAT COSTS ME MOST, AND WHY

THE ONE CHANGE I WILL MAKE FIRST

Score each room from 1 (works against me in the evening) to 5 (helps me settle). No seal: an observation tool, built from the questions in Chapter 14.

BEYOND THE BOOK · B

Your Sensitivity Map

Chapter 2 showed that sensitivity has three faces: how you react to noise, light, or crowds; how you cope with many things at once; and how much you notice beauty and small changes. Chapter 13 showed that the same dial turns up the bad and the good. Map both sides of yours, channel by channel.

CHANNEL	WHAT OVERLOADS ME	HOW STRONGLY	WHAT RESTORES ME
Sound voices, traffic, music, silence		1 2 3 4 5	
Light bright rooms, sun, screens, lamps		1 2 3 4 5	
Touch & body clothes, temperature, hunger, tiredness		1 2 3 4 5	
Smell & taste perfume, cooking, food		1 2 3 4 5	
People crowds, one-to-one, conflict, company		1 2 3 4 5	
Pace too much at once, deadlines, slow days		1 2 3 4 5	
Beauty music, art, nature, small changes		1 2 3 4 5	

READ IT SIDEWAYS

Look for a channel that is strong in both columns. That is the dial at work: the same sensitivity that makes a noisy office hard may make a quiet park restore you faster than most people.

WHAT THIS IS NOT

A questionnaire, a score, or a diagnosis. It is a page that turns a vague feeling into a short list. Validated scales exist; your doctor or a psychologist can give you one if you want a number.

NOTES

BEYOND THE BOOK · C

The Headline Card

The four questions from Chapter 3 and the four from Chapter 4, on two cards you can cut out and keep in your wallet, or photograph and keep on your phone. Passes all four: worth your attention. Fails two or more: it can wait.

"The gene for…"

Chapter 3

1. **How many people?**
   Tens of thousands, not hundreds.
2. **Was it repeated?**
   A second, independent, larger study.
3. **How much does it explain?**
   Not just "significant." Usually under 1 percent.
4. **A group, or you?**
   Scores describe groups, not destinies.

"This changes your DNA…"

Chapter 4

1. **Who was studied?**
   Rats and mice are a model, not a mirror.
2. **Which tissue?**
   Blood tells you about blood.
3. **How big?**
   No size given? Be wary.
4. **Cause or company?**
   Together is not because.

✂ cut along the dashed lines · print at 100 percent

HEADLINES I CHECKED THIS MONTH

DATE	HEADLINE	CARD	SCORE /4

NOTES

A Thirty-Day Plan

Chapter 14 asks for one change at a time. This spreads the four levers over a month, one per week, so each has time to show you whether it works for you. Keep the earlier weeks going as you add the next only if they were easy; otherwise, keep just the one that helped most.

Week 1 — Light

Outside in the first hour; overhead lights off two to three hours before bed; a dark bedroom.

MODERATE

M T W T F S S

Week 2 — Quiet

The quietest room for sleep, alerts off at night, earplugs if you need them, twenty quiet minutes a day.

PRELIMINARY

M T W T F S S

Week 3 — Green

120 minutes in green or blue places, in any combination; the window with the most sky on the days you cannot go out.

MODERATE

M T W T F S S

Week 4 — People

One unhurried conversation, no screens; one call to someone you have been meaning to call; a walk together.

MODERATE

M T W T F S S

EVERY SUNDAY EVENING, TWO MINUTES

WEEK	SLEPT (AVG 1–10)	FELT (AVG 1–10)	KEEP IT?	NOTE
1 · Light				
2 · Quiet				
3 · Green				
4 · People				

DAYS 29 AND 30: THE LEVER THAT MATTERED MOST FOR ME

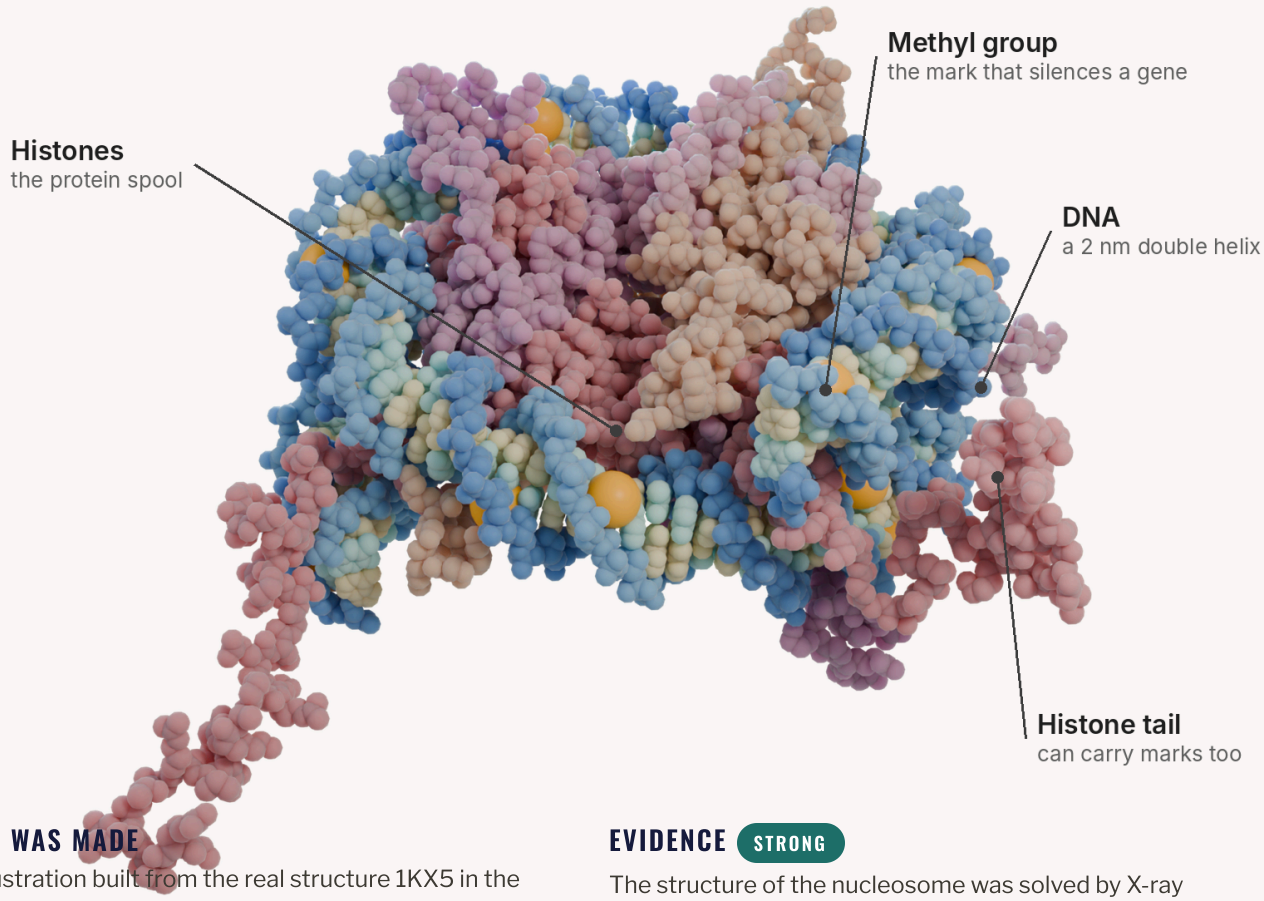
WHAT I WILL KEEP FOR THE NEXT THREE MONTHS

NOTES

PLATE 4 · CHAPTER 4

Methylation, a Switch on DNA

DNA wraps around protein spools called histones. Tiny chemical marks, methyl groups, help decide whether a gene can be read or stays silent.



HOW IT WAS MADE

A 3D illustration built from the real structure 1KX5 in the Protein Data Bank (Davey et al., 2002): every sphere is an atom. The methyl groups are placed on cytosines for illustration.

EVIDENCE STRONG

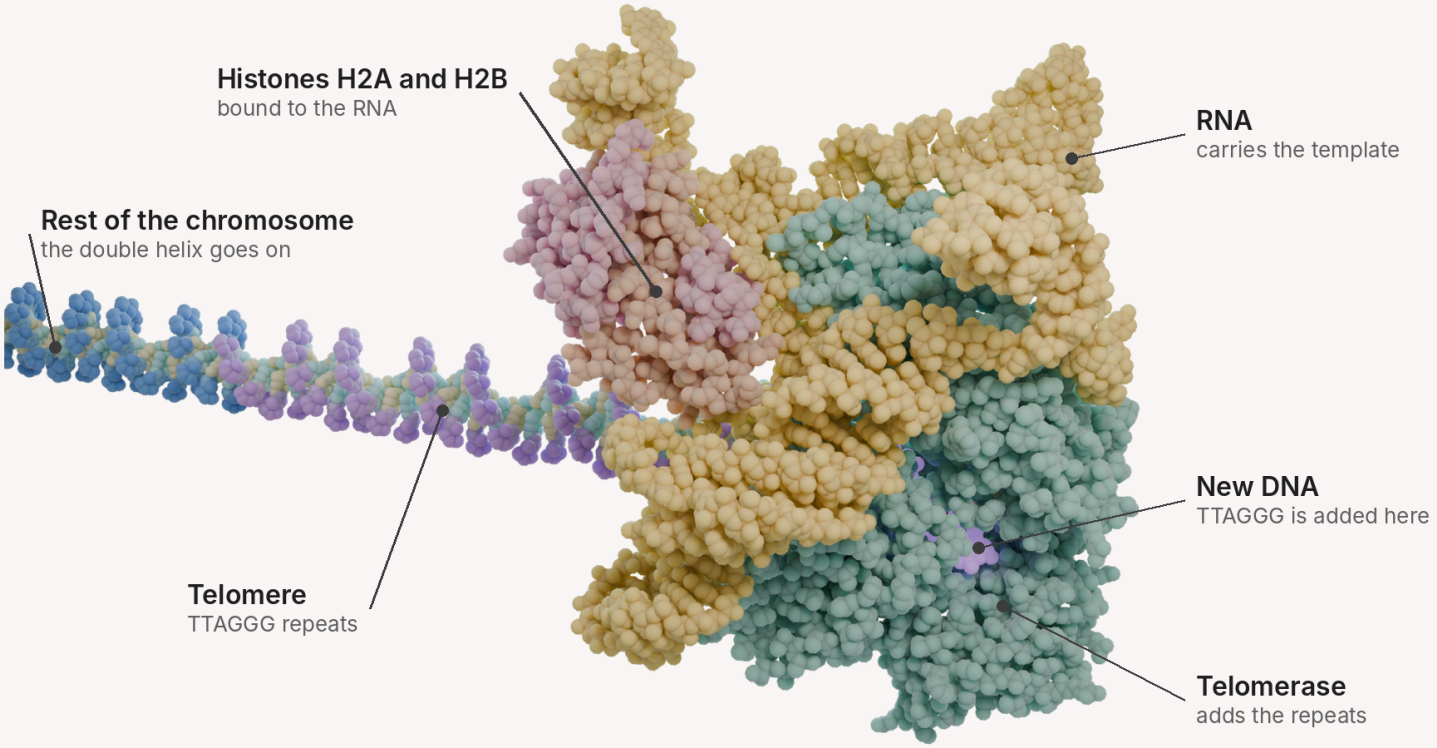
The structure of the nucleosome was solved by X-ray crystallography (Luger et al., 1997).

PLATE 12 · CHAPTER 7

The End of the Chromosome

Every chromosome ends in hundreds or thousands of protective TTAGGG repeats. Telomerase can add them back by copying its own RNA template.

T T A G G G × hundreds to thousands, at each end



HOW IT WAS MADE

A 3D illustration built from the real structure 7BG9 in the Protein Data Bank (Ghanim et al., *Nature*, 2021): every sphere is an atom. The telomeric DNA outside the enzyme is modeled.

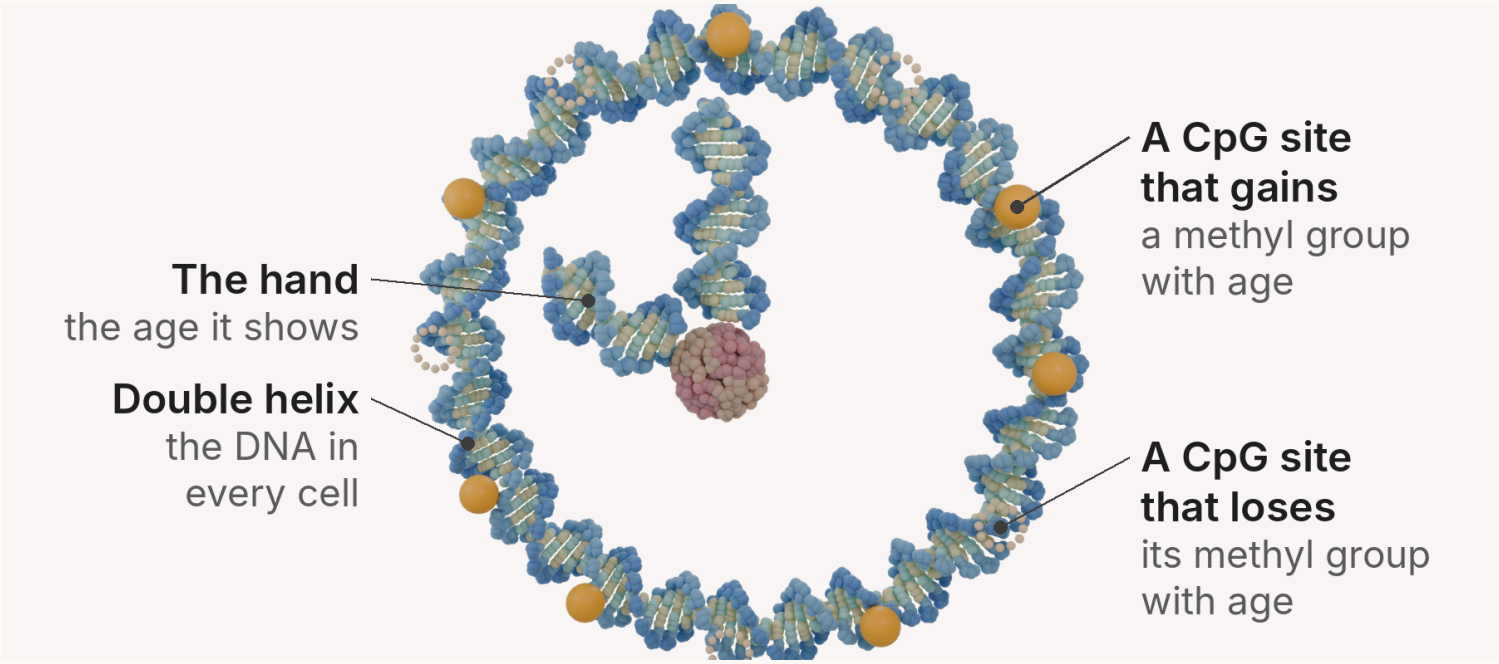
EVIDENCE STRONG

The human telomerase structure was solved by cryo-electron microscopy. What telomere length means for your health is a different, weaker question: see Chapters 8 and 13.

PLATE 15 · CHAPTER 9

A Clock Written in DNA

Over the years, some CpG sites in DNA gain methyl groups and others lose them. Measuring 353 of them can estimate the age of almost any tissue.



HOW IT WAS MADE

An illustrative 3D scene: the double helix is built sphere by sphere at atomic scale, but the clock is a metaphor. The real sites are spread across the whole genome.

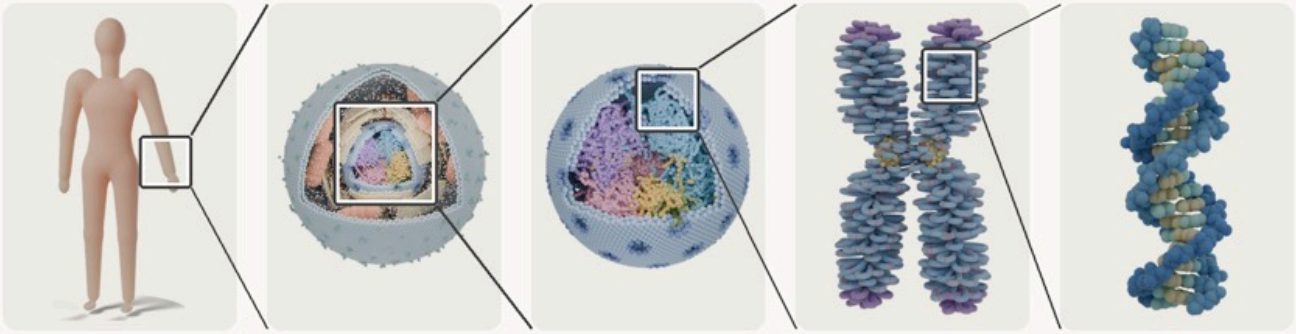
EVIDENCE STRONG

Methylation at 353 CpG sites estimates age in most tissues (Horvath, 2013).

FIGURE 1.3

From the Body to DNA

Five steps closer. Almost every one of your cells has a nucleus; inside it are 46 chromosomes, and each chromosome is a single, very long molecule of DNA wound on protein spools.



Your body	**A cell**	**The nucleus**	**A chromosome**	**The double helix**
about 37 trillion cells	50 to 100 in a row span 1 mm	holds about 2 meters of DNA	one of 46, packed tight to divide	2 nanometers wide

STRONG Organization of the cell, the nucleus, and DNA. Double helix: Watson and Crick (1953); PDB 1GLU, Luisi et al. (1991).

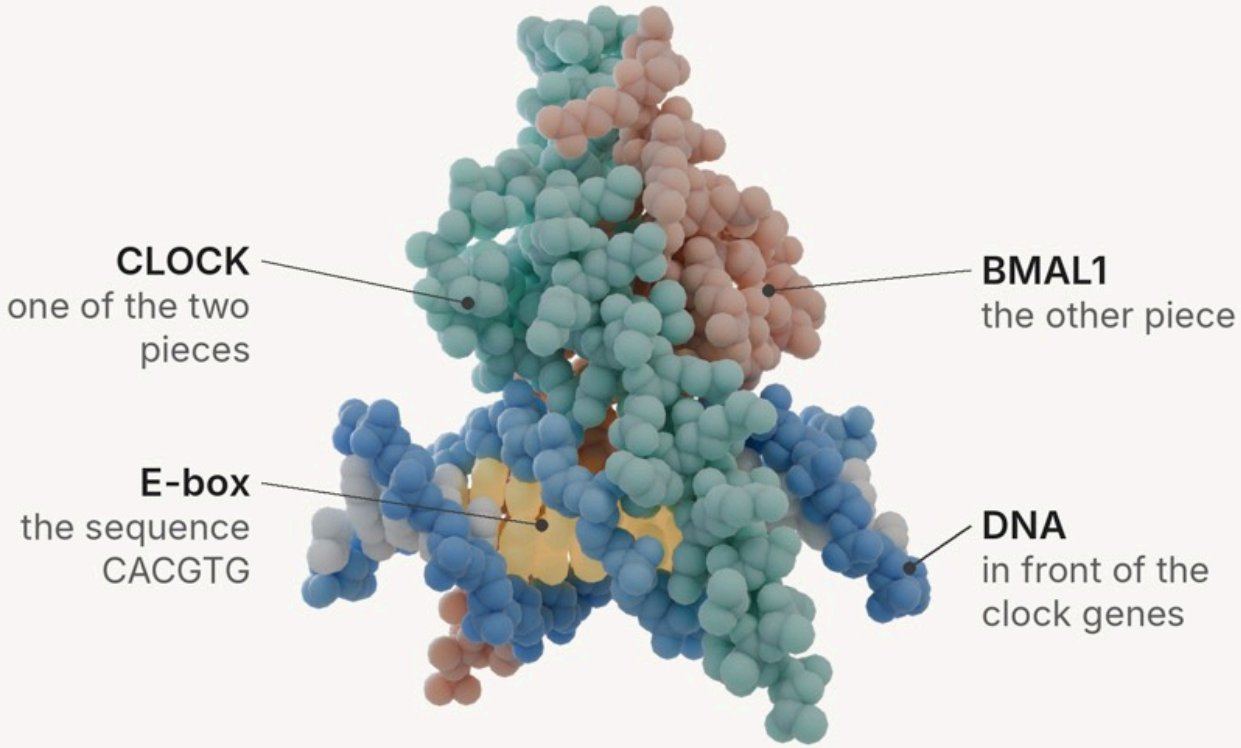
MODERATE About 37 trillion cells is an estimate, not a census. Source: Bianconi et al. (2013).

3D illustration. The first four steps are illustrative models and are not to scale with each other. The double helix is built atom by atom from the DNA in the real structure 1GLU in the Protein Data Bank, with the protein removed. The chromosome is shown in its compact form, the one it takes when the cell is about to divide.

FIGURE 11.1

The Clock in Every Cell

In almost every cell, two proteins, CLOCK and BMAL1, pair up and grip the DNA at a sequence called the E-box. From there they switch on the genes that keep a rhythm of about 24 hours.



STRONG Crystal structure of CLOCK and BMAL1 bound to the E-box (Wang et al., 2013).

3D illustration built from the real structure 4H10 in the Protein Data Bank (Wang et al., 2013): each sphere is an atom. Only the parts of the proteins that touch the DNA are shown.

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The Studies Behind These Pages

The main studies each practice rests on. The full bibliography, with every reference in the book, is at the end of *The Listening Genome*.

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