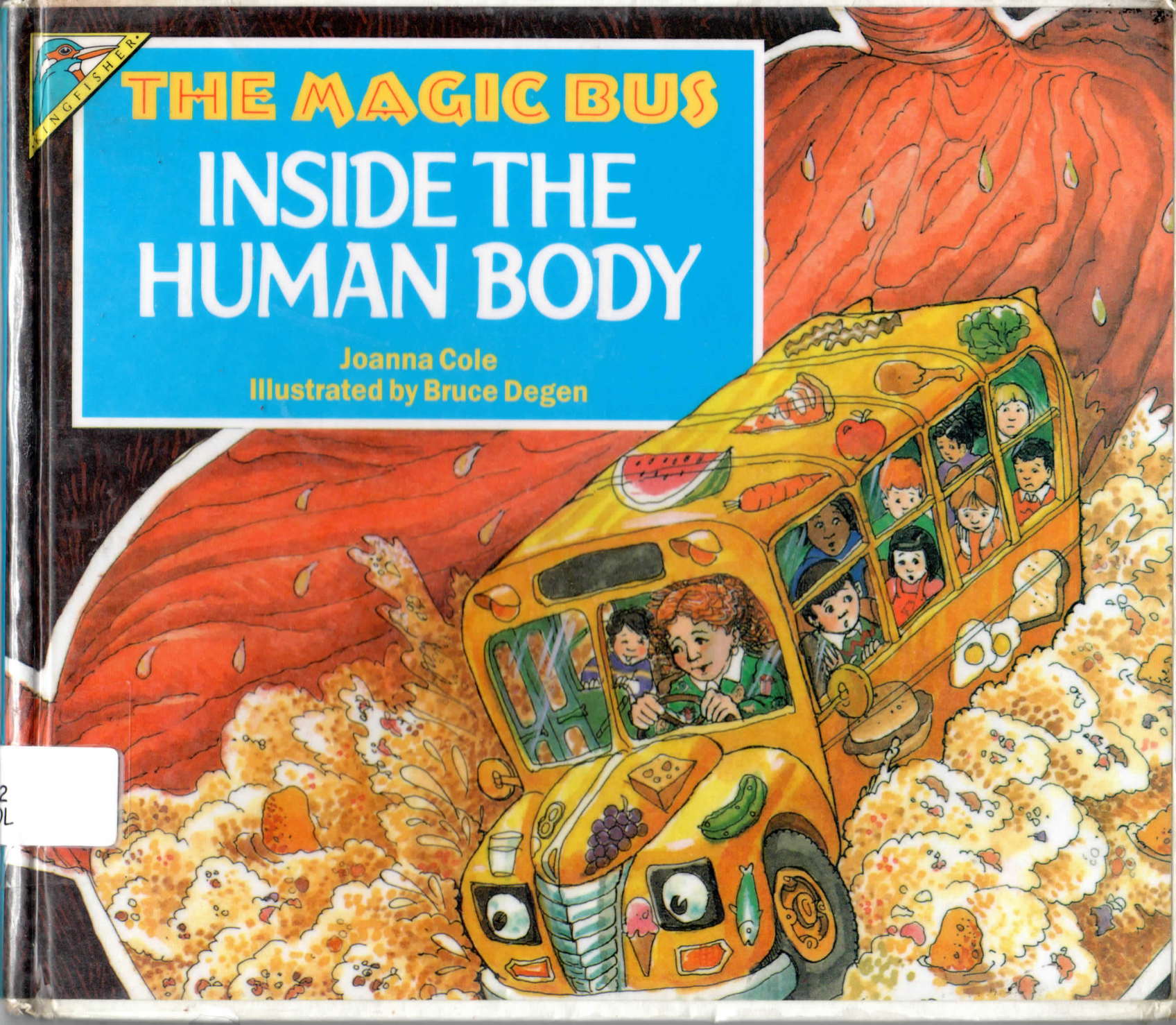




THE MAGIC BUS INSIDE THE HUMAN BODY

Joanna Cole
Illustrated by Bruce Degen



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Kingfisher Books

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WE'RE GOING TO
LEARN ABOUT
OURSELVES.
THIS SHOULD
INTEREST YOU,
ARNOLD!

It all began when Ms Frizzle showed our class a filmstrip about the human body. We knew trouble was about to start, because we knew Ms Frizzle was the strangest teacher in the school.

MY FAVOURITE
HERBIVORE



MY FAVOURITE
CARNIVORE



I CAN'T TAKE
THE PRESSURE!

MY FAVOURITE
OMNIVORE



ool.
A FILMSTRIP
IS ONLY THE
BEGINNING,
YOU KNOW.

SHE PROBABLY
HAS BOOKS
ABOUT THIS,
TOO!

WHEN'S
BREAK?

YOUR
WONDERFUL
BODY

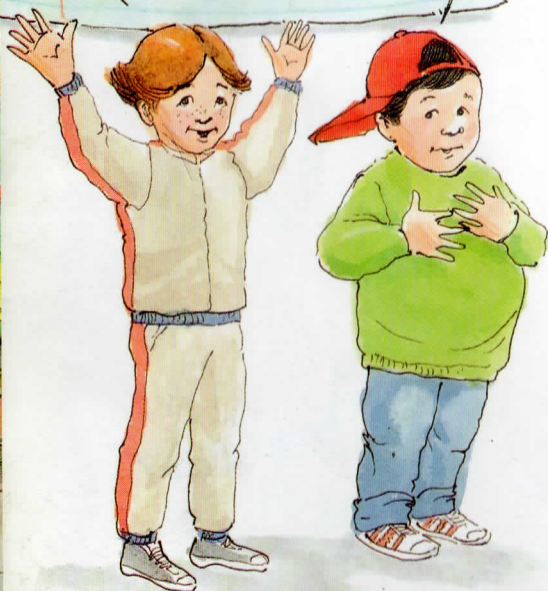


YOUR BODY IS
MADE OF CELLS
by Rachel

Your body seems
to be all one piece,
but actually it is
made of trillions
of tiny pieces,
called cells.

MY BODY IS
MADE OF
TRILLIONS
OF CELLS.

SO IS MINE!



The very next day, The Friz made us
do an experiment on our own bodies.

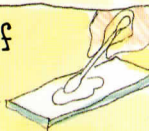
SEE YOUR OWN CELLS

Most cells are so small that we can't see
them without a microscope.

① Gently scrape
inside of cheek
with toothpick



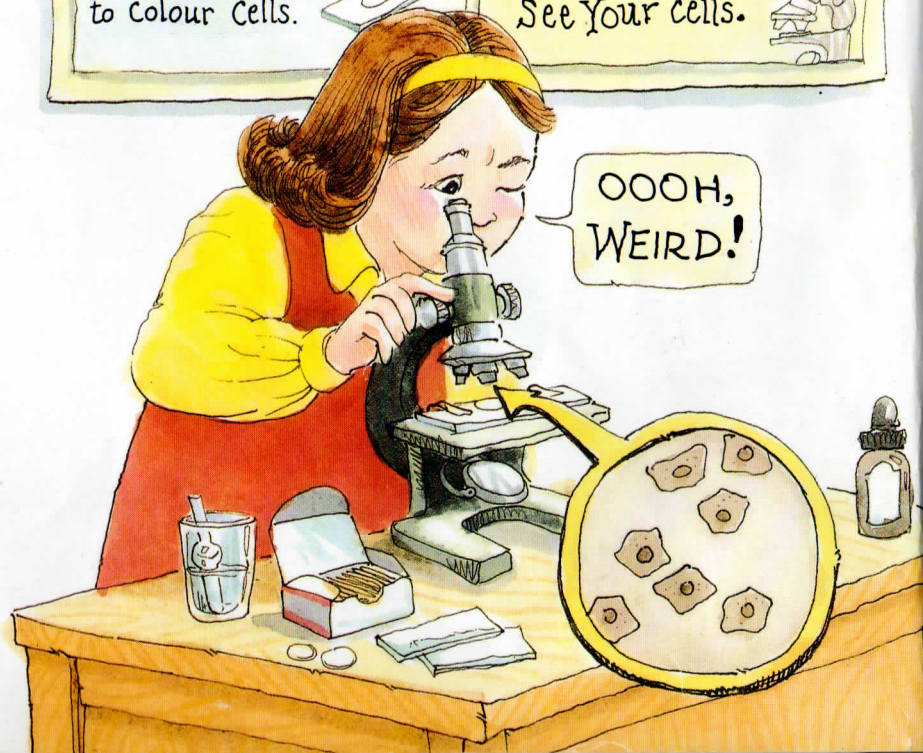
② Stir end of
toothpick in
drop of water
on a slide.



③ Add a drop of
Iodine Solution
to colour Cells.



④ Look at slide
under microscope.
See Your cells.



Then she announced that we were going on a class trip to the science museum. We were going to see an exhibit about how our bodies get energy from the food we eat.

YOUR CELLS NEED ENERGY
TO HELP YOU GROW, MOVE,
TALK, THINK, AND PLAY.

JUST BEING IN
MS FRIZZLE'S CLASS
TAKES ALL MY
ENERGY.

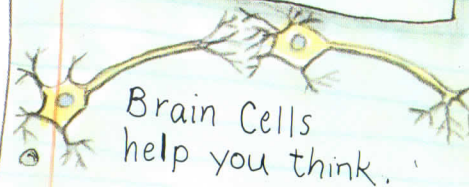
DIFFERENT KINDS OF CELLS
HAVE DIFFERENT JOBS
by Gregory



Lung cells
help you
breathe.



Muscle cells
help you move



Brain cells
help you think.



YOUR TONGUE IS
COVERED WITH THOUSANDS
OF TASTE BUDS
by Arnold

Different parts of the
tongue have taste buds
that detect different
flavours.



The trip started out like any other trip.
We rode to the museum
in the old school bus.
Along the way,
we stopped at a park for lunch.

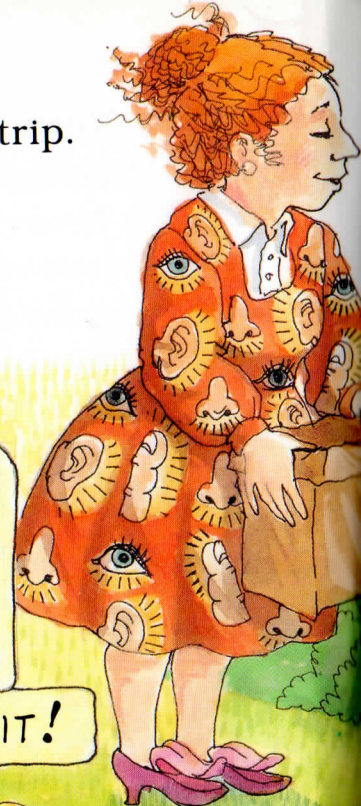
LEFTOVER
FISH FINGERS?!
ICK!

I'LL SWOP YOU THESE
TERRIFIC FISH FINGERS
FOR THAT HORRIBLE
PEANUT BUTTER AND
BANANA SANDWICH.

FORGET IT!

TAKE A LOOK
AT HER SHOES.

PLEASE!
I'M EATING!



When it was time to go,
everyone got back on the bus—
everyone but Arnold.
He was still at the picnic table,
daydreaming and eating
a bag of Cheesie-Weesies.

WHEN YOU EAT, YOUR BODY DIGESTS
THE FOOD SO YOUR CELLS CAN USE IT
TO MAKE ENERGY.



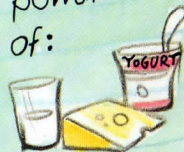
YOUR BODY NEEDS GOOD FOOD

by Carmen

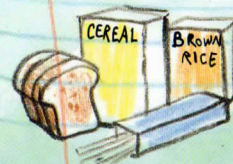
For high energy and
good growing power
eat lots of:



Fresh fruits
and Vegetables



Milk and
Milk products



Whole grain
cereal and pasta



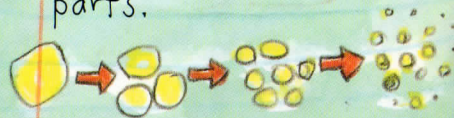
Lean Meats, Fish,
Poultry, AND EGGS

AND NOT TOO MUCH JUNK FOOD

A SCIENCE WORD

by Dorothy Ann

Digestion comes from
a word that means
to divide. When food
is digested it is divided
into smaller and smaller
parts.



"Hurry up, Arnold!" called Ms Frizzle. She reached for the ignition key, but instead she pushed a strange little button nearby.

ARNOLD'S REALLY OUT TO LUNCH.

At once, we started shrinking and spinning through the air.

From inside, we couldn't see what was happening. All we knew was that we landed suddenly.

GULP!
HEY, WHERE'S THE BUS?



what
All
at
lenly..

and then we were going down a dark tunnel.
We had no idea where we were.
But, as usual, Ms Frizzle knew.
She said we were inside a human body,
going down the oesophagus—
the tube that leads from the throat
to the stomach.
Most of us were too upset
about leaving Arnold behind
to pay much attention.

WHERE'S
ARNOLD?

HE GOT
LEFT!

THAT'S WHAT
HAPPENS
WHEN YOU
EAT JUNK
FOOD!

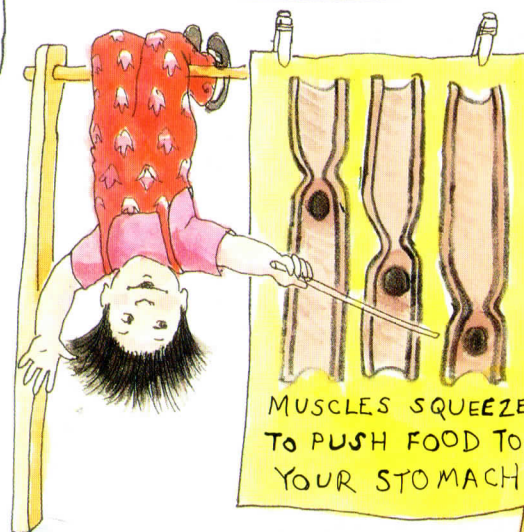
I THOUGHT
WE WERE GOING
TO THE MUSEUM.

THERE'S BEEN A
SLIGHT CHANGE
OF PLANS...
WE'RE BEING
DIGESTED
INSTEAD.

FOOD GOES TO YOUR STOMACH THROUGH THE OESOPHAGUS

by Wanda

The food does not
just fall down.
It is pushed along
by muscle actions
the way toothpaste
is squeezed out of
a tube. That's why
you can swallow even
when you are
upside down.



WHY DOES YOUR STOMACH GROWL?

by Phil

Sometimes your stomach churns when there is not much food in it. Then the gases in your stomach make a gurgling sound.

YOUR STOMACH IS LIKE A BUILT-IN FOOD PROCESSOR.

GURGLE!

ROLL UP YOUR WINDOWS, CHILDREN.

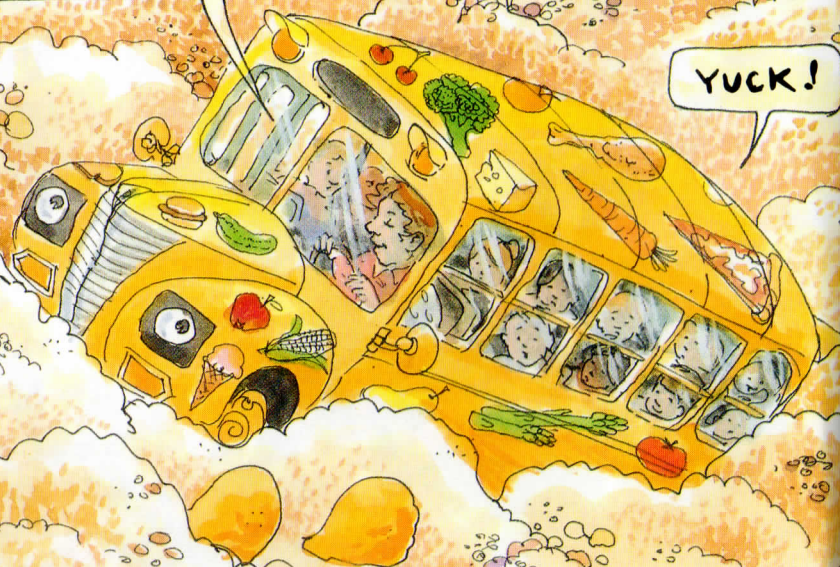
YUCK!

"We are now passing into the stomach," said Ms Frizzle.

It wasn't exactly *quiet* in there.

The walls of the stomach moved in and out, churning and mashing the food into a thick liquid.

The bus was turning round and round, and digestive juice splashed the windows. Now we knew how it felt to be a hamburger!



Ms Frizzle drove to the bottom of the stomach.

"We'll drive through this opening to the small intestine," she said.

IN THE SMALL INTESTINE,
FOOD IS BROKEN DOWN
INTO MOLECULES TINY
ENOUGH FOR THE BODY
CELLS TO USE.

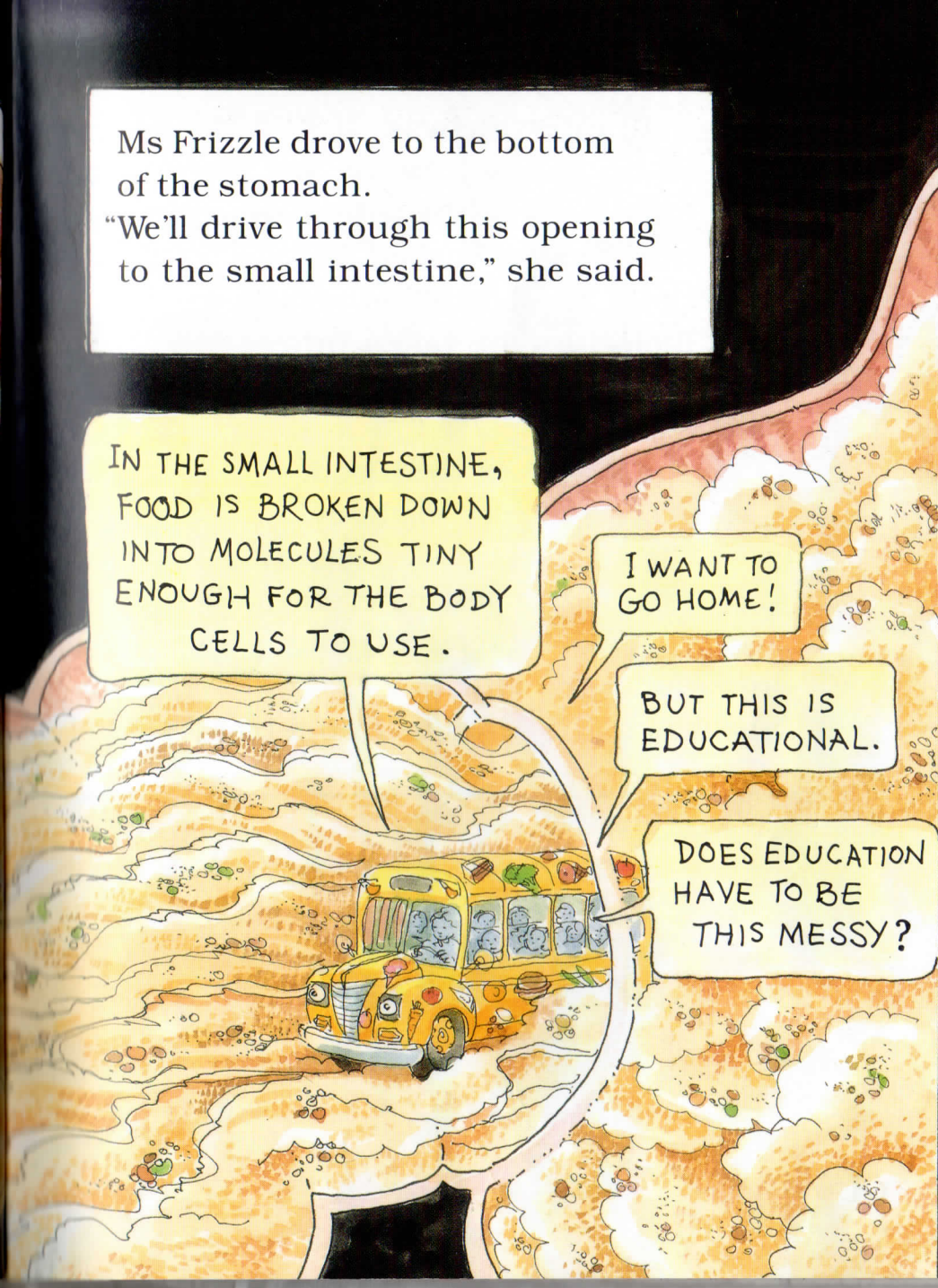
I WANT TO
GO HOME!

BUT THIS IS
EDUCATIONAL.

DOES EDUCATION
HAVE TO BE
THIS MESSY?

I DON'T FEEL
SO GOOD.
MAYBE IT WAS
SOMETHING
I ATE.

POOR
KID!



WHY ARE THE INTESTINES COILED UP?

by John

In an adult the intestines are 7.5 metres (25 feet) long. If they were stretched out straight, a person would have to be as tall as a house.

The small intestine was a coiled-up hollow tube.

The inner walls of the tube were covered with tiny “fingers” called *villi*.

“In the *villi* are tiny blood vessels.

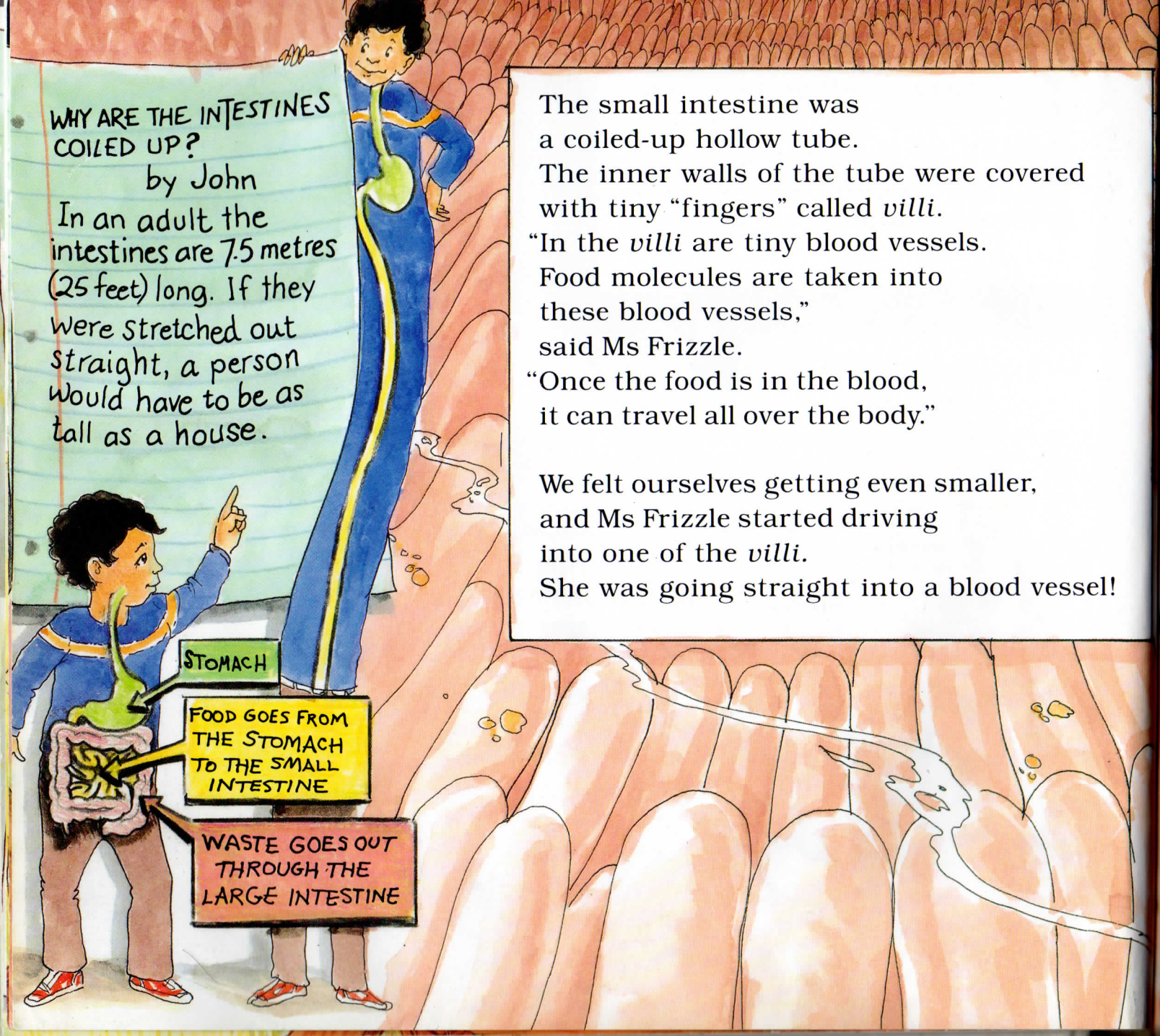
Food molecules are taken into these blood vessels,”

said Ms Frizzle.

“Once the food is in the blood,
it can travel all over the body.”

We felt ourselves getting even smaller, and Ms Frizzle started driving into one of the *villi*.

She was going straight into a blood vessel!



CLASS, THE BUS IS
FOLLOWING THE PATH
OF THE FOOD MOLECULES
INTO THE BLOOD.

YOU MEAN THIS BODY
THINKS WE'RE FOOD?

THAT'S BETTER
THAN BEING WASTE.

YES! IT'S SO
HORRIBLE!

I WISH ARNOLD
WERE HERE
TO SEE THIS.

• ANOTHER SCIENCE WORD
by Dorothy Ann

Blood Vessels are
tubes that carry
blood. They are
like pipelines
running through
your body.

ssel!



WHAT IS BLOOD MADE OF?

by Molly

A little more than half the blood is a yellowish fluid called PLASMA.

The rest of the blood is made of floating cells.

PLASMA

BLOOD CELLS

250,000,000

WHY IS BLOOD RED?

by Shirley

Without a microscope, blood looks red because there are so many red blood cells in it!

In every drop of blood there are 250 million red blood cells.

RED BLOOD CELLS CARRY OXYGEN

FOOD MOLECULES

Now we were in the blood, but it did not look red.

"Blood is not just a red liquid," explained Ms Frizzle.

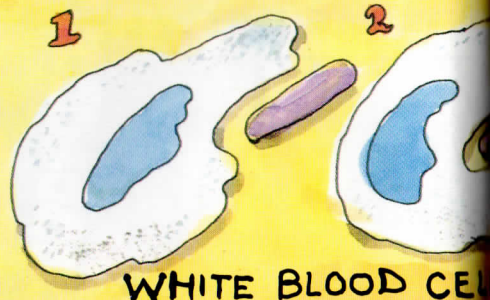
"Blood is made of cells, floating in a clear fluid."

"Those cells look like red rubber saucers!" someone called out.

"Those are red blood cells," Ms Frizzle said.

"Red blood cells carry oxygen from the lungs to all the cells of the body."

DID YOU SEE THAT?



WHITE BLOOD CELLS

Here and there a white blood cell was busy destroying disease germs. "White blood cells are like soldiers protecting your body from enemies," said Ms Frizzle.

WHAT IS BLOOD FOR?
by Ralph
Your blood is like a delivery service. It carries food and oxygen to your body's cells and waste products away from the cells.

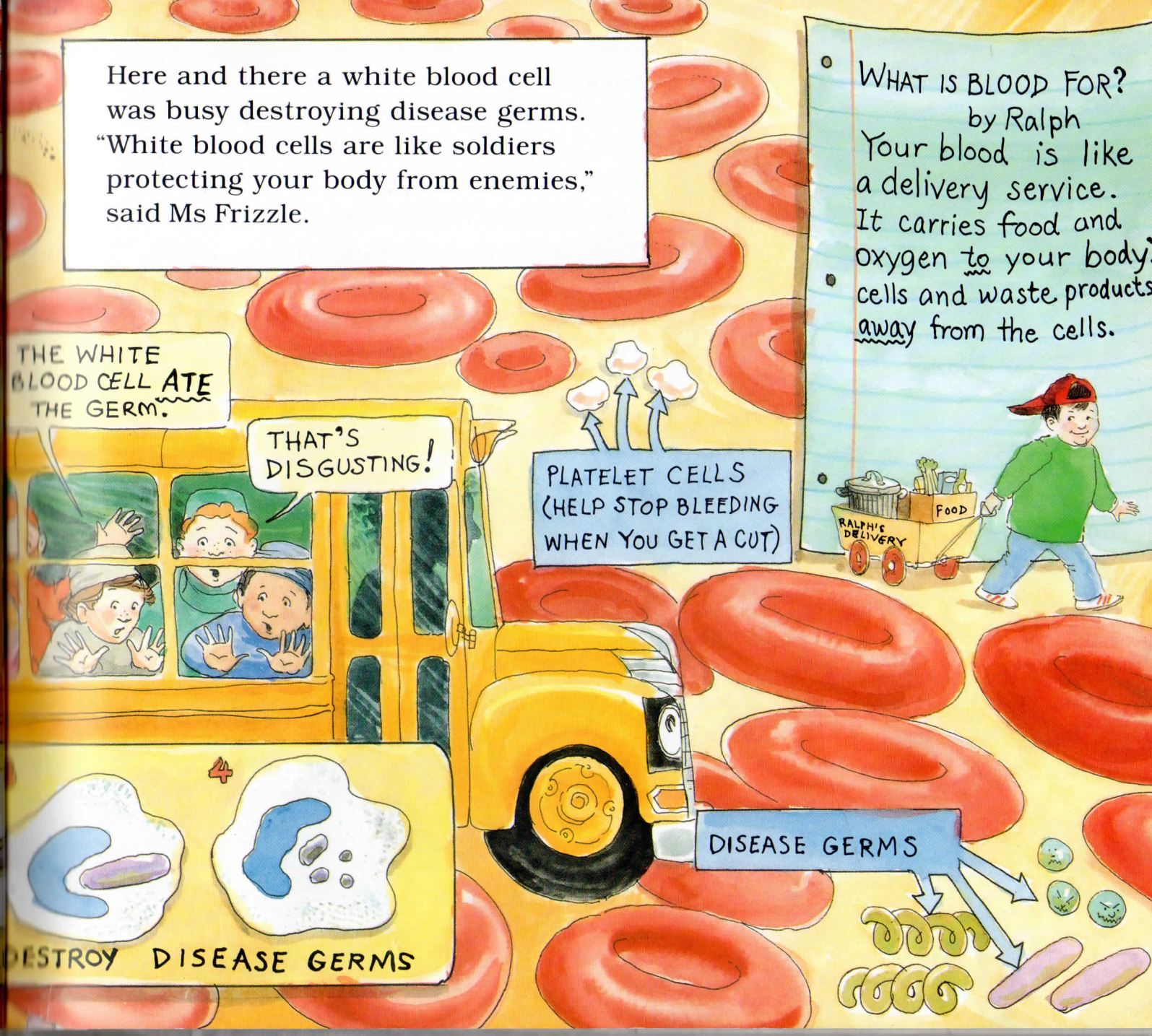
THE WHITE BLOOD CELL ATE THE GERM.

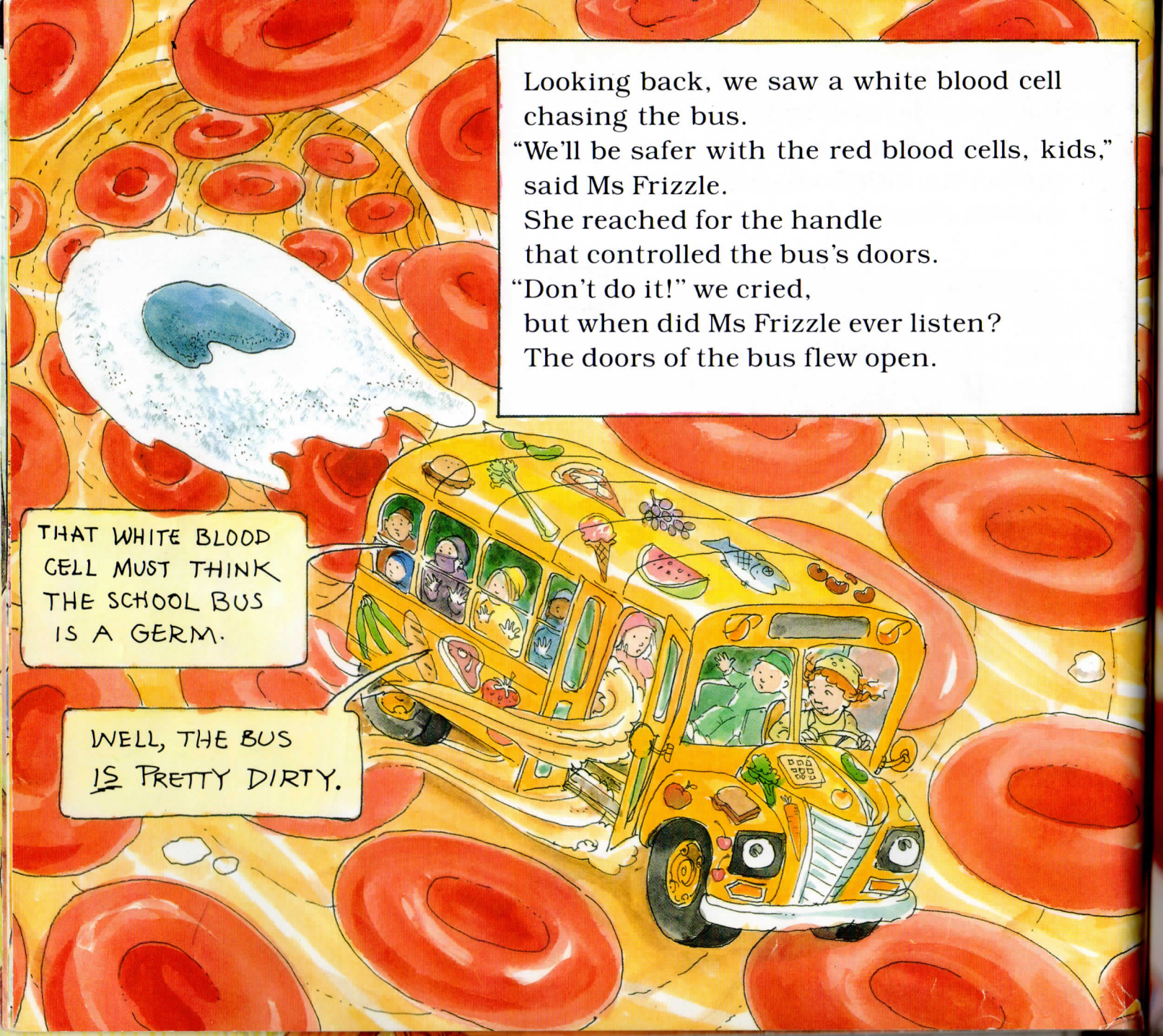
THAT'S DISGUSTING!

PLATELET CELLS
(HELP STOP BLEEDING
WHEN YOU GET A CUT)

DISEASE GERMS

DESTROY DISEASE GERMS





Looking back, we saw a white blood cell chasing the bus.

"We'll be safer with the red blood cells, kids," said Ms Frizzle.

She reached for the handle that controlled the bus's doors.

"Don't do it!" we cried, but when did Ms Frizzle ever listen? The doors of the bus flew open.

THAT WHITE BLOOD CELL MUST THINK THE SCHOOL BUS IS A GERM.

WELL, THE BUS IS PRETTY DIRTY.

We were swept out of the bus
and into the bloodstream.
"Everybody hitch a ride!" called The Friz.
Each kid grabbed a red blood cell
as it went by.
Our last glimpse of the bus
was when it went into another blood vessel—
with the white blood cell right behind it!

WHY CAN'T WE
JUST HAVE
SPELLING TESTS
LIKE OTHER KIDS?

WE'LL NEVER
GET OUT OF
HERE NOW!

THESE RED BLOOD CELLS
HAVE TURNED DULL RED
— THEY NEED
MORE OXYGEN.

MEANWHILE...

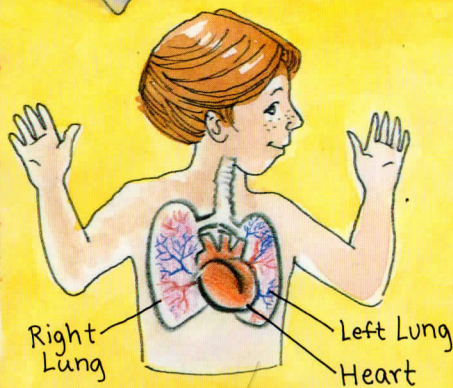
OH MY GOSH!
I'M LOST!

DON'T
PANIC



YOUR HEART IS A PUMP by Florrie

When the walls of the heart chambers squeeze together they pump out blood, just the way you can squeeze water out of a plastic squeeze bottle.



YOUR HEART PUMPS
USED BLOOD INTO THE LUNGS
TO GET FRESH OXYGEN.

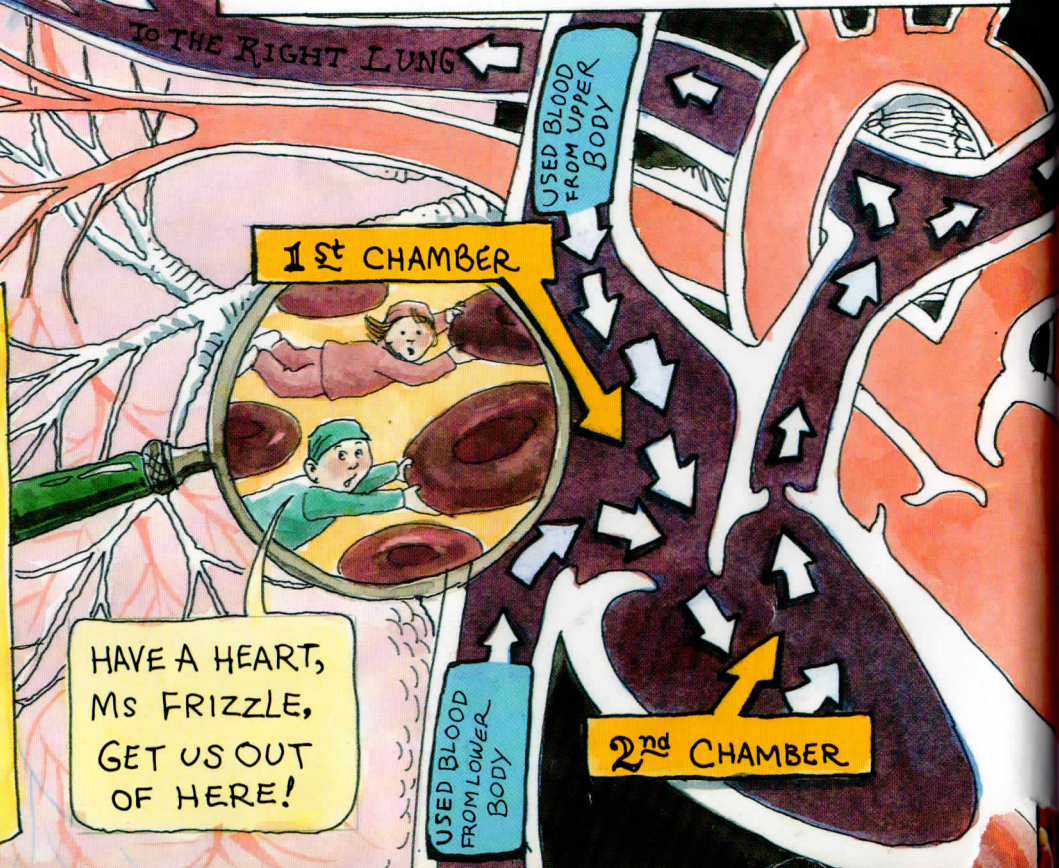
RIGHT LUNG

The next thing we knew,
we had flowed into the heart.

"Inside the heart are four hollow spaces,
called *chambers*," said Ms F.

"Each chamber is a little pump."

The two chambers on the right side
of the heart took in used blood
from the body and pumped it to
the lungs.



In the lungs, the red cells
picked up fresh oxygen.

WE GET NEW OXYGEN
FROM THE AIR EACH
TIME WE BREATHE IN.

WE GET RID OF A WASTE
GAS—CARBON DIOXIDE—
EACH TIME WE BREATHE
OUT.

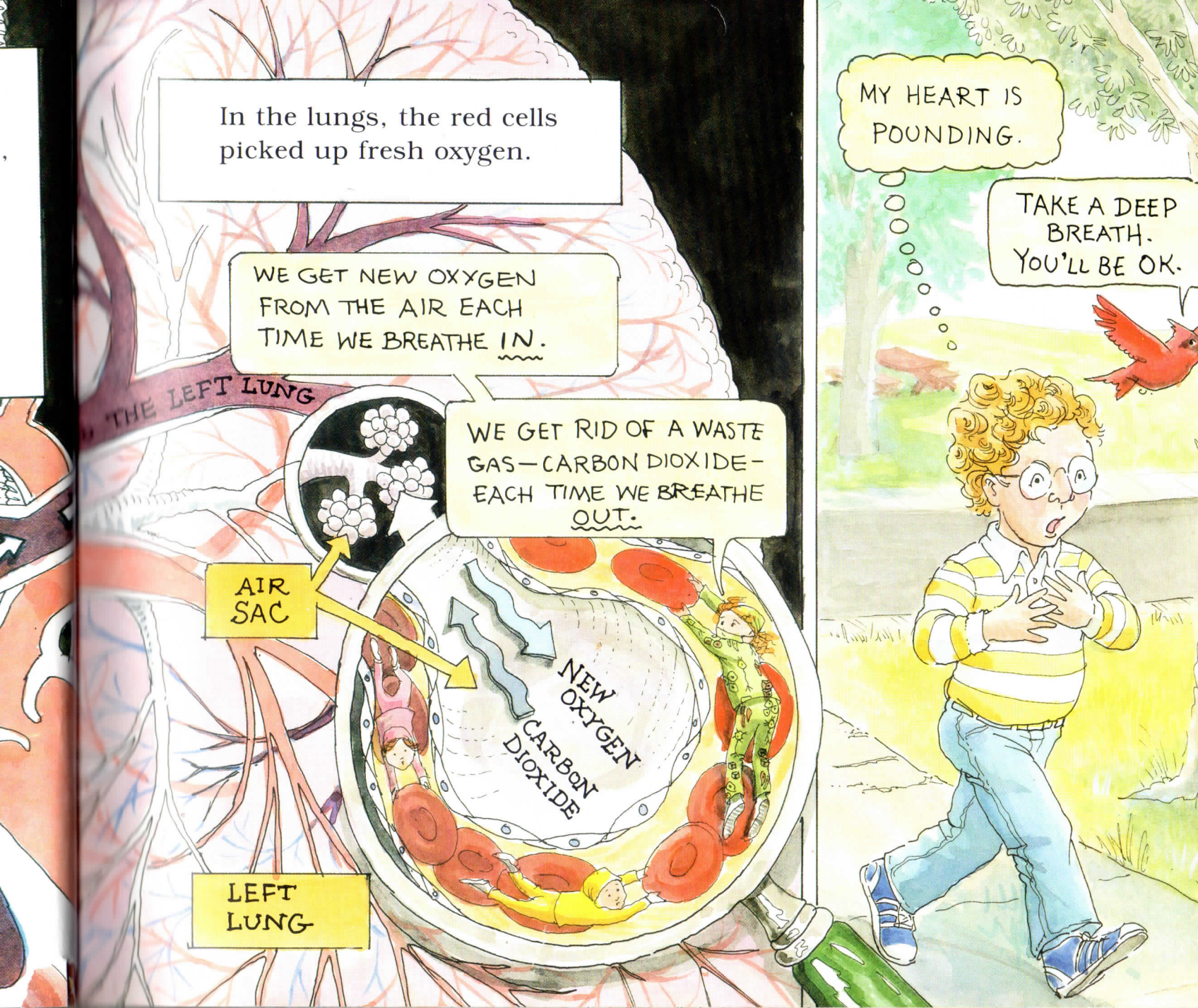
AIR
SAC

LEFT
LUNG

NEW
OXYGEN
CARBON
DIOXIDE

MY HEART IS
POUNDING.

TAKE A DEEP
BREATH.
YOU'LL BE OK.



BLOOD GOES ROUND
AND ROUND

by Michael

In less than a minute
your blood makes
a trip all around
your body.

This is called the
circulation of the
blood.

ONE MORE SCIENCE WORD

by Dorothy Ann

Circulate comes from
a word that means
"to circle". Blood
Circulates - circles -
all around your body.



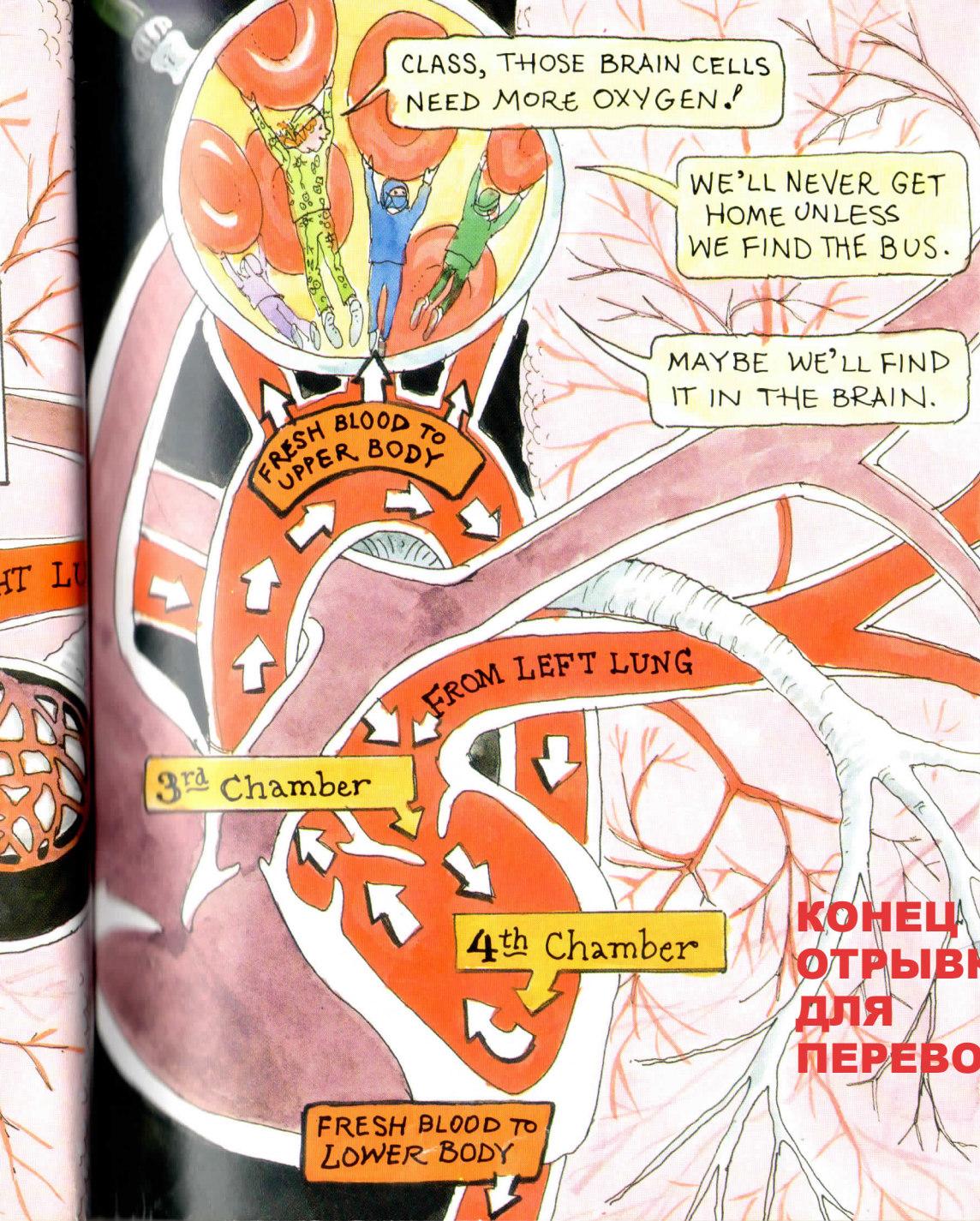
From the lungs, our red blood cells
carried us back to the heart.

This time we were on the left side
of the heart—the side that pumps
fresh blood back to the body again.

"Kids, it looks as if these red
blood cells are on their way to
the brain," said Ms Frizzle.

LOOK! WHEN THE
RED BLOOD CELLS
PICK UP OXYGEN, THEY
TURN BRIGHT RED.





**КОНЕЦ
ОТРЫВКА
ДЛЯ
ПЕРЕВОДА!**



- YOUR BRAIN IS ALWAYS WORKING by Alex Even when you're sleeping, your brain controls your heartbeat, breathing, and other body functions.

When we reached the brain, we let go of our red blood cells and squeezed out of the blood vessel. It was hard to believe that this wrinkled grey blob was the control centre of the body.

CHILDREN, WE ARE WALKING ON THE CEREBRAL CORTEX, THE PINKISH GREY, OUTER LAYER OF THE BRAIN. WITHOUT IT WE COULDN'T SEE, HEAR, SMELL, TOUCH, TASTE, TALK, MOVE, OR THINK!

YOUR BRAIN NEVER LIES DOWN ON THE JOB.

3:00 A.M. and still at it.



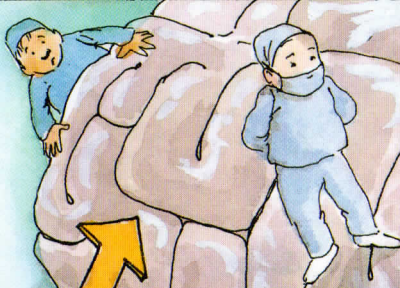
CEREBRAL CORTEX

Controls thinking, moving and the five Senses.

SPEECH CENTRE

HEARING CENTRE

MOTOR CENTRE (TELLS MUSCLES TO)



Ms Frizzle said
the brain is made of
billions of busy nerve cells.
They are constantly sending
and receiving messages
from the eyes, ears, muscles,
and other parts of the body.

TOUCH
CENTRE

DO YOU THINK
WE'LL BE SMARTER
AFTER THIS?

I HOPE
SO!

WHERE'S
THE BUS?

VISION
CENTRE

CEREBELLUM:

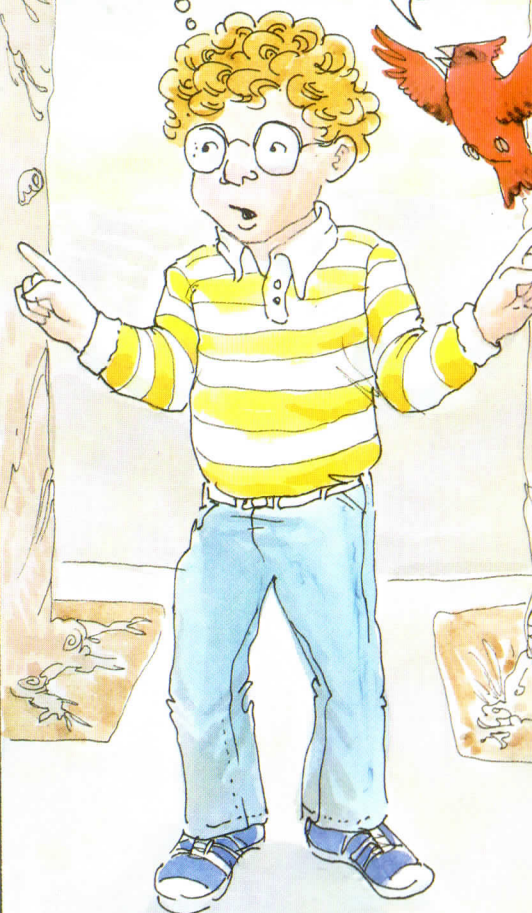
Helps you keep your
balance, Helps muscles
work together.

BRAIN STEM:

Controls body functions
like heartbeat and
breathing.

LET'S SEE...
MS FRIZZLE WAS
DRIVING THAT WAY
TO THE MUSEUM,
SO OUR SCHOOL
MUST BE THIS WAY.

GOOD THINKING



IF YOU WANT TO
MOVE A MUSCLE
by Amanda Jane

The motor area
(in the cortex) of your
brain sends out a
message to move.
The message travels
down the spinal cord
and through the nerves
that control the
muscles.

We left the head by climbing down
the bones of the spine.

Inside the bones was the spinal cord—
a thick bundle of nerve cells
stretching from the brain.

Smaller bundles of nerve cells branched
out from each side of the spinal cord.
These carried nerve messages
to all the parts of the body.

THE SPINAL CORD
CONNECTS THE
BRAIN WITH THE
NERVES THAT GO
TO THE BODY.

DON'T LOO
DOWN!

SPINAL CORD

I THINK I'M LOSING
MY NERVE!

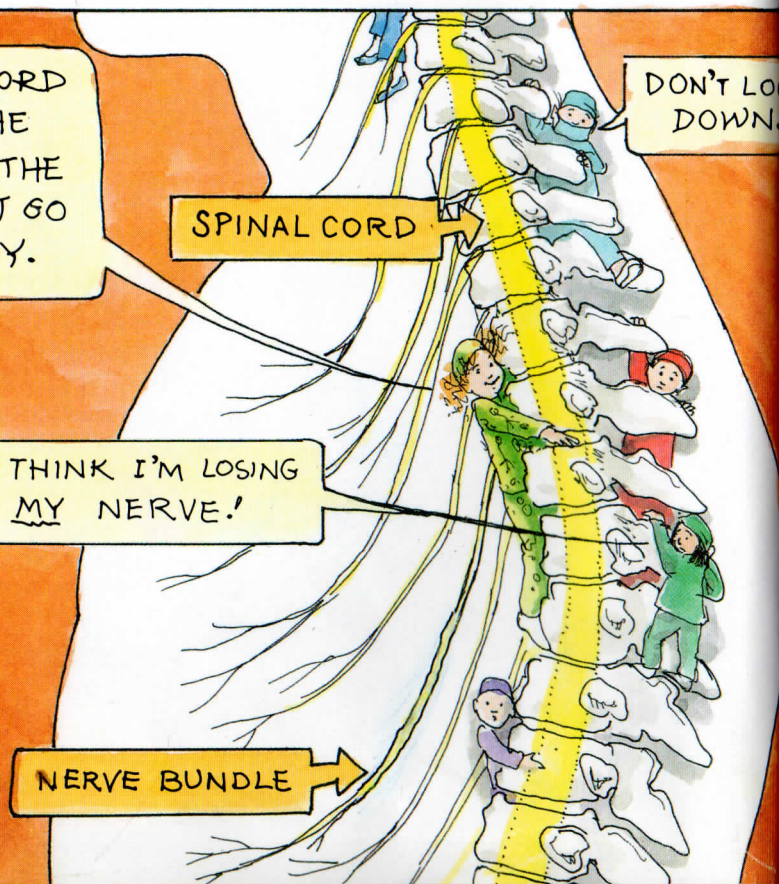
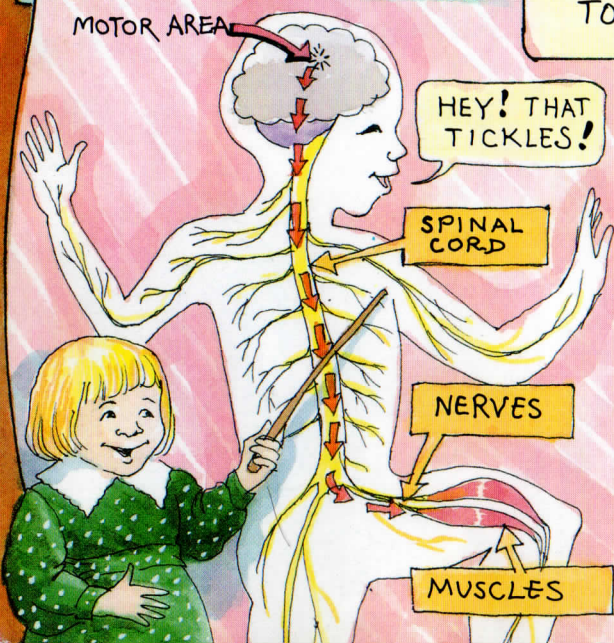
HEY! THAT
TICKLES!

SPINAL
CORD

NERVES

MUSCLES

NERVE BUNDLE



We followed some nerves that went to the leg muscles.

The leg muscles were working hard.

They needed a lot of energy.

They used up a lot of food and oxygen from the blood.

The heart was beating faster to carry fresh blood to the muscle cells.

CHILDREN, WE ARE SLIDING ON A MUSCLE. FROM HERE, WE'LL RETURN TO THE BLOODSTREAM.

NERVE ENDING

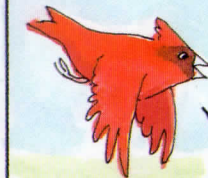
MUSCLE FIBRE

I WONDER WHERE ARNOLD IS NOW.

I HAVE THE STRANGEST FEELING HE'S CLOSE BY.

I'LL GET THERE SOONER IF I RUN!
(PANT! PANT!)

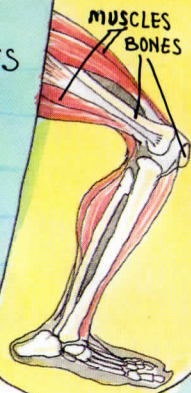
THE MORE ACTIVE YOU ARE THE FASTER YOUR HEART BEATS.



THUMP THUMP

MUSCLES MOVE YOUR BONES by Tim

Some muscles are attached to bones. When the muscles contract (get shorter) they pull on the bones. That makes the bones move, and then you move.



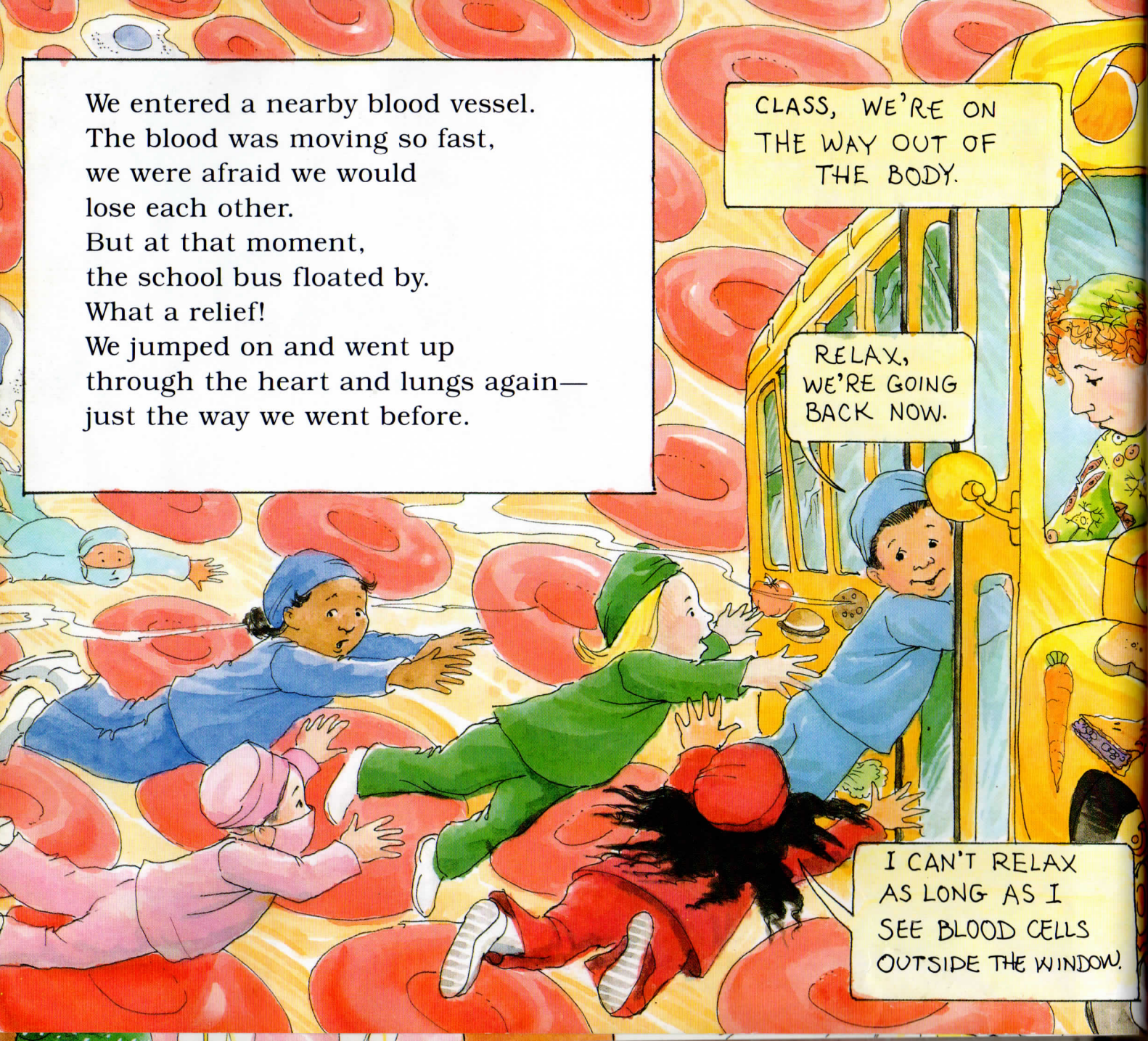
BLOOD VESSEL

We entered a nearby blood vessel.
The blood was moving so fast,
we were afraid we would
lose each other.
But at that moment,
the school bus floated by.
What a relief!
We jumped on and went up
through the heart and lungs again—
just the way we went before.

CLASS, WE'RE ON
THE WAY OUT OF
THE BODY.

RELAX,
WE'RE GOING
BACK NOW.

I CAN'T RELAX
AS LONG AS I
SEE BLOOD CELLS
OUTSIDE THE WINDOW.



When we emerged from the bloodsteam,
we were in a huge open space.
“Where are we?” asked a kid.
Ms Frizzle explained,
“Children, this is the nasal cavity.”
“The what?” we asked.
“The inside of the nose,” said The Friz.
Suddenly, we heard a deafening noise.
It sounded like “Ah-aa-aa-ah!”

WE'RE IN
A NOSE?

THIS TIME
SHE'S GONE
TOO FAR.

THIS IS
TOO MUCH!



I THINK I'M
GOING TO
SNEEZE...

USE YOUR
HANKIE.



WHAT MAKES YOU SNEEZE?

by Phoebe

If something is tickling the inside of your nose, the tickling signals your brain.

The brain makes you take an extra big breath. (That's when you say Aaahh!)

Then your brain makes your chest muscles squeeze your lungs.

Air rushes out at speeds of up to 100 miles per hour. (That's when you say choo!)



Then we heard,
"CHOOOOOOO!"

CLASS, THE SOUND
YOU HEAR IS A SNEEZE.

ANYTHING IN THE NOSE
CAN MAKE YOU SNEEZE.
IT COULD BE A BIT
OF DIRT OR DUST,
OR SOME BACTERIA.

IN THIS CASE
IT HAPPENS
TO BE A
SCHOOL BUS.



A tremendous blast of air
hit the bus full force.
We flew forward,
spinning round and round.


CHILDREN, PREPARE
FOR LANDING.
PLEASE REMAIN SEATED
UNTIL THE SCHOOL BUS
HAS COME TO A
COMPLETE STOP.

IS SHE FOR REAL?

A-A-A-AH
CHOO!

BLESS YOU!





WE'RE BACK!

We were going so fast,
we couldn't see anything,
but we could tell we were getting bigger.
Then—thud!—we landed.
There we were, back at school.
And there was Arnold,
in the school car park,
blowing his nose.

LOOK! THERE'S
ARNOLD!

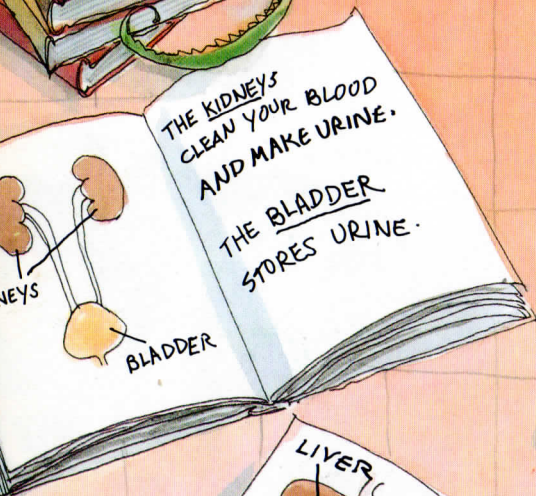
THUD

"Arnold!" we said, "the trip was *amazing!*
You should have been there!"

WHERE WERE YOU?



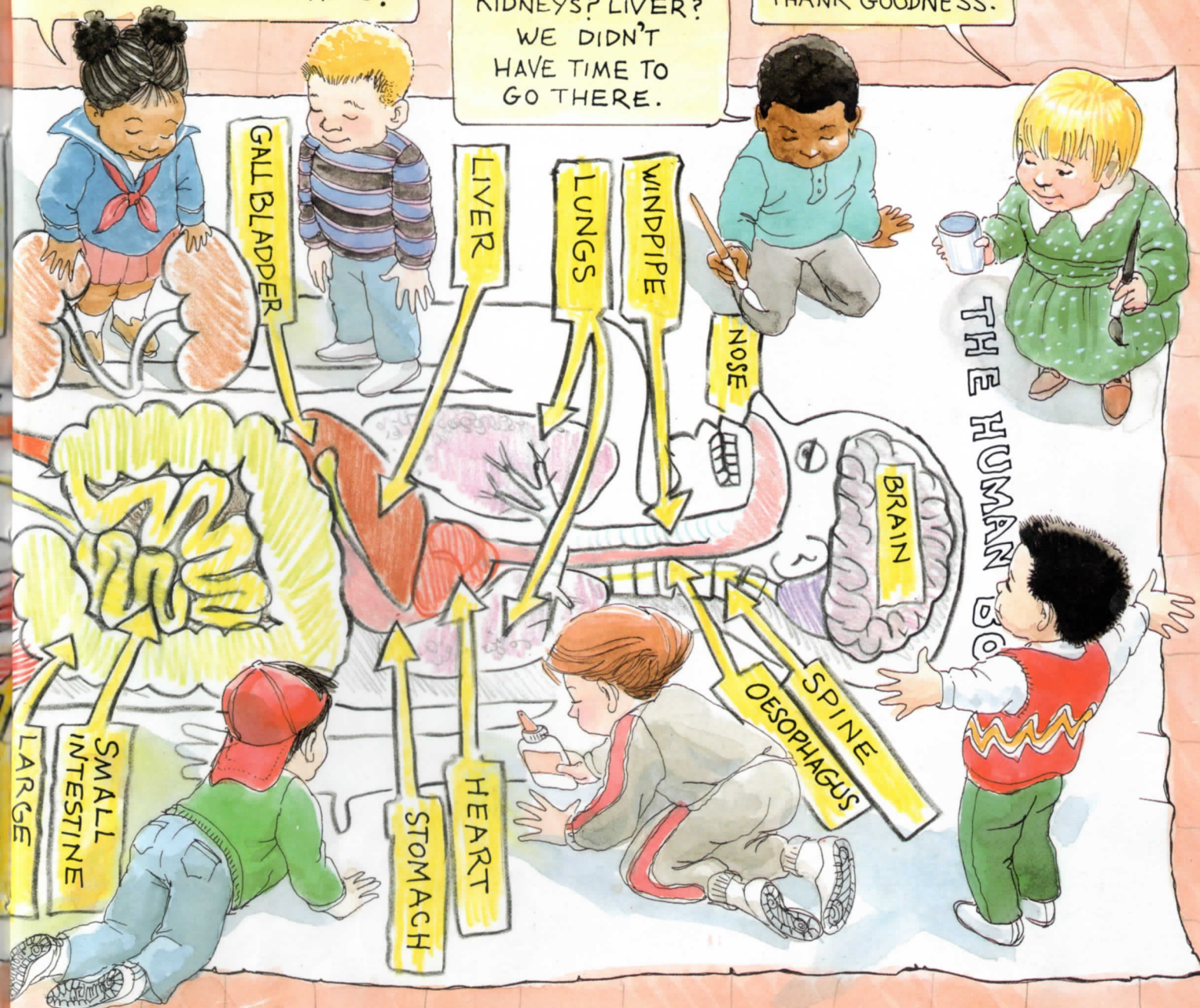
Back in the classroom,
it was business as usual.
Ms Frizzle made us draw
a chart of the human body
for the bulletin board.



CAN WE SLIP THESE KIDNEYS
IN BEHIND THE INTESTINES?

KIDNEYS? LIVER?
WE DIDN'T
HAVE TIME TO
GO THERE.

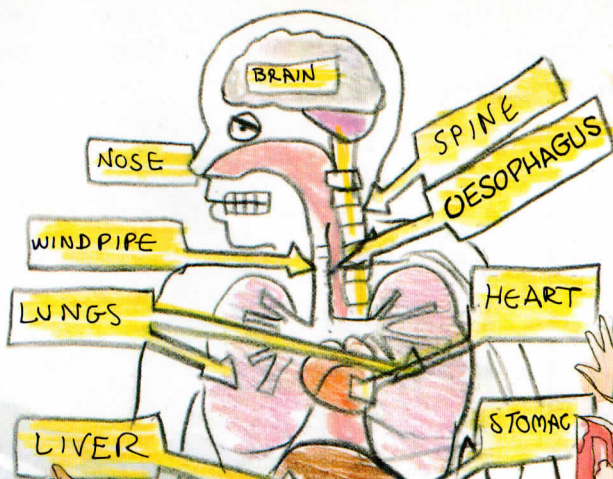
THANK GOODNESS.



WHAT A TRIP!

I'D LIKE TO
GO TO THE
LUNGS AGAIN.

I'D RATHER
GO TO
HAWAII.



HEY!



At last, everything was quiet
in Ms Frizzle's class—
everything, of course,
except her dress!

SHE MUST BUY
HER CLOTHES
IN OUTER SPACE.

DON'T GIVE HER ANY IDEAS!

RED BLOOD
CELLS
ARE CUTE!

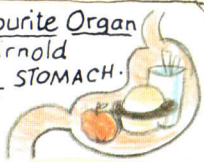


by Molly

My Favourite
Organ
by Carmen

THE NOSE
It's a Front-
runner

My favourite Organ
by Arnold
A FULL STOMACH.



I ♥ MY
EARS
by WANDA



MY LUNG.

KEEP
THEM
CLEAN
by Tim



OUR SOLAR SYSTEM

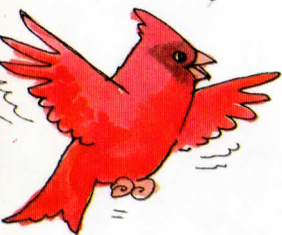


TRUE-OR-FALSE TEST

HOW TO:

Read the sentences below. Decide if each one is true or false. To see if you are correct, check the answers on the opposite page.

STOP! TAKE THIS TEST!
DO NOT WATCH T.V....YET.
DO NOT GET A SNACK...YET.
DO NOT PLAY A VIDEO
GAME...YET.
FIRST TAKE THIS TEST.



QUESTIONS:

1. A school bus can enter someone's body and kids can go on a tour. True or false? ~~F~~
2. Museums are boring. True or false? ~~F~~
3. Arnold should not have tried to get back to school by himself. True or false? T
4. Children cannot breathe or talk when they are surrounded by a liquid. True or false? T
5. If the children really were as small as cells, we couldn't see them without a microscope. True or false? T
6. White blood cells actually chase and destroy disease germs. True or false? T
7. Ms Frizzle really knew where Arnold was the whole time. True or false? T

ANSWERS:

1. False! That could not happen in real life. (Not even to Arnold.)

But in this story the author had to make it happen. Otherwise, the book would have been about a trip to a museum, instead of a trip through the body.

2. False! Museums are interesting and fun. But they are not as strange and gross as actually going inside a human body.

3. True! In real life, it would have been safer if Arnold had found a police officer to help.

4. True. If children were *really* inside a blood vessel, they would drown. It must have been magic.

5. True! The pictures in this book show the cells and the children greatly enlarged.

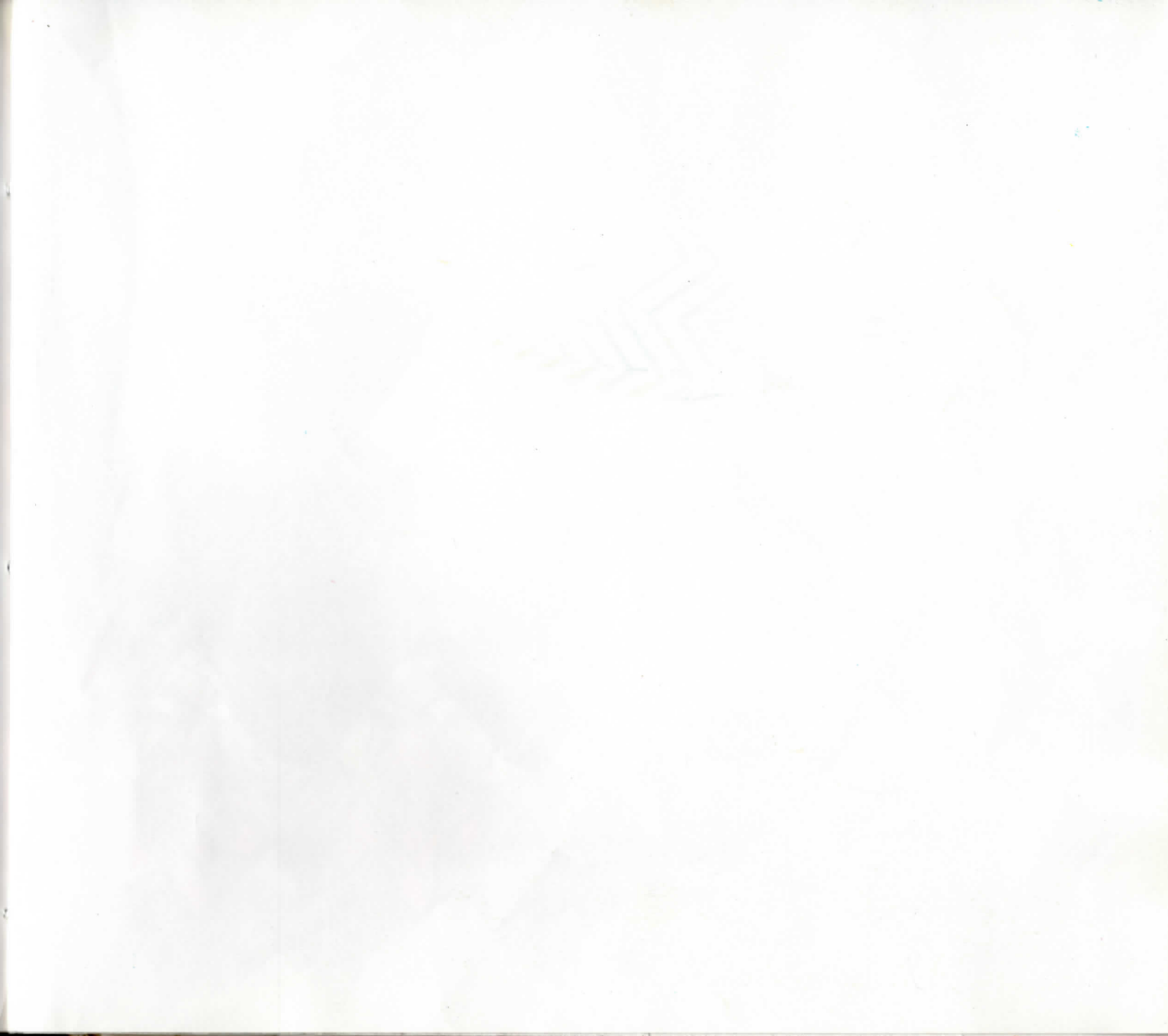
6. True! As unbelievable as it seems, real white blood cells actually behave just like the ones in this book. They even squeeze through the cells of blood vessel walls to capture germs in your organs and tissues.

7. Probably true. No one is absolutely sure, but most people think Ms Frizzle knows *everything*.



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