Chapter 1: Gut city

“Argh, you stupid *Eukaryote*! Why don’t you get it!?”

In the bustling city of Biopolis, in the not too distant future, amidst towering laboratories and buzzing research centers, there lives a young budding scientist named Minerva Thalyss. Minerva was no ordinary student; she was an adventurer, driven by a never ending curiosity about the world's most intricate mysteries. One day, she would often say to herself, one day she would unravel the mysteries of life itself!

Right now, though,she was stuck in her room, studying for her biological mathematics finals, which she was definitely going to fail, according to her professor.

Untangling and calculating all those metabolic pathways, reaction cascades, and networks between microorganisms—how on earth was she supposed to cram all of this into her head by the end of the week? Her thoughts were scattered and all she could think of was her sister sleeping in the next room

Her sister FLEMING had been battling a serious infection for quite some time and lately matters had worsened. Antibiotics seemed to have no effect a common phenomenon these days due to the rampant misuse of antibiotics in decades past.

Minerva looked out the dark window to find her own reflection staring back at her—messy blond hair falling over an oval face framed by glasses, her dark clothes blending into the shadows of the room. As the daughter of the famous Professor Dr. Alexander Thalyss, life wasn’t always easy. Her professors often compared her to him - It felt as if his brilliance was a yardstick she could never measure up to.

Then again: her father had taught her so much—things that stuck in her mind even when she didn’t fully understand them. Just the other day, he had been talking about Donna Haraway’s concept of *SYM-POY-EESIS* the idea that all life is co-created through interconnected relationships. She hadn’t entirely grasped what he meant, but his words lingered in her thoughts.

“To survive,” he had said, “humans must embrace their role as participants in the vast web of life, rather than trying to master it.”
Whatever that meant.

Minerva sighed as she turned to her laptop display: 9 p.m. Her father was late.What was taking him so long? The dinner she had prepared for him sat on the kitchen counter, stone cold.

“AIDEN,” she said to her AI companion, “can you check where my father is, again? He should have been home by now.”
AIDEN’s calm voice responded: “I’m sorry, Minerva, but his signal is still very weak. I am unable to locate him.”
Minerva frowned. “That’s strange,” she muttered.

AIDEN: “Wait,”he signal is strengthening. It appears he is…in the next room?
Well, that can’t be accurate…

She ran to her sister’s room, only to find FLEMING fast asleep. No one else was there. Her heart sank.

She had been afraid this might happen. Ever since her sister fell ill , she'd noticed her father acting strangely—He'd been distracted and restless, like he was up to something. He had hinted at it, but she never thought he would actually go through with it.

Had he lost his mind?

The MicroNaut Prototype! A nanotech device (one of two her father had secretly built) that could shrink down and allowed its pilot to enter the microbiome of any willing (or unwilling) subject -to roam the vast universe within the human body.

For 24 hours. No more, no less.

When the clock ran out, you had better make sure you were out of there, or the whole thing would blow up to its original size and….well….use your imagination.

It was a wonderful invention that potentially could save lives, one her father took great pride in. But It hadn't been properly tested. And needless to say: the risks of using it were enormous.

"AIDEN," she cried, "can you check what his last command was when he programmed the MicroNaut?"

AIDEN's voice responded after a brief pause: "Command detected: enter // Gut City. It seems he has been there for approximately eight hours… but I cannot pinpoint his exact location. The signal is distorted."

Minerva's stomach tightened. Of all the places in the microbiome, why did it have to be Gut City?
"AIDEN," she said firmly, standing up from her chair, "rerun the nav-code he used—I'm going after him."

AIDEN: "Are you sure about this, Minerva? "Your father explicitly instructed you not to use the MicroNaut.."

"No," she admitted as she grabbed her gear with trembling hands, "but I have a gut feeling about this."

As she stood in her father's lab surrounded by the humming sound of the MicroNaut Prototype's systems, AIDEN's voice broke through her thoughts.

AIDEN: "Minerva, are you ready? Once you enter this microscopic realm, there is no telling what you will find. It could be very dangerous and remember, you have to make your way back here within 24 hours! Do you copy?

Minerva paused, her hands trembling slightly as she adjusted some handles and checked the coordinates one last time. . She took a deep breath and smiled faintly. "Copy, I'm ready," she said. "Let's do this." "launch!"

And with that voice command, she activated the device, which started to shake heavily. The world around her blurred and distorted as she felt herself being pulled into an entirely new dimension— And then….everything went silent.

Chapter 2: The resistance.

Minerva stood motionless in the dense, humid outskirts of Gut City, leaving the Micronaut hovering in idle mode behind her. She knew that, when it was time to leave, all she had to do was ask Aiden to call it, and it would come and find her.

She looked around. Towering bacterial colonies loomed over her like ancient trees, their surfaces a kaleidoscope of vibrant colors - deep purples, electric blues, and pulsating greens. These microbial structures ~~weren't static; they~~ shimmered with constant activity, as if millions of tiny lights were dancing across their surfaces.

“Well..this is…… weird…”she said to herself

Her eyes darted from one alien structure to another. Something she recognised as *Filamentous fungi* stretched between bacterial colonies like bridges. Clusters of viruses created shimmering clouds that drifted through the landscape. Everywhere she looked, there was movement, interaction, and life.

The air was dense with an invisible fog of biochemical signals ~~-~~zapping between countless microorganisms.
Despite the overwhelming, scary strangeness, Minerva felt a sense of awe. As she took it all in, she realized she was witnessing the true face of the microbiome~~.~~

But how on earth was she going to find her dad in this crazy, uncharted world that existed inside her sister Fleming?

“AIDEN,” she whispered, “where the heck are we, and how can we find my father?”

Aiden’s voice crackled in her earpiece. “I’m detecting an imbalance in microbial activity ahead. It appears that certain bacterial populations are behaving unusually… possibly due to external interference - perhaps that would be a good place to avoid…”

“Or…to start?

AIDEN: I will activate the micro-translator, that way you’ll be able to understand what some of these microbes are saying.

MINERVA: Thanks…. I guess?

Minerva moved cautiously toward the source of the disruption, following the 3d hologram that popped out of her watch.

Colonies of purple Bacteroides and blue Firmicutes, I think!?”

AIDEN: “Correct,which, if you remember your lessons correctly, should work together to digest food and produce essential nutrients”

“Right…” Minerva replied, “but they seem…disorganized…scared even?”
The whole thing felt sort of …off.

“These aren’t normal interactions,” Minerva said, closely observing a group of microbes exchanging plasmids at an alarming rate.

AIDEN’s tone grew serious. “They’re sharing genetic material… specifically, antibiotic resistance genes.”

Minerva's eyes widened. She had read about this phenomenon but - obviously - had never witnessed it firsthand. Horizontal gene transfer — the ability of bacteria to share resistance traits — was one of the coolest, but also most pressing challenges in modern medicine. It allowed harmful bacteria to evolve defenses against antibiotics faster than humans could develop new ones.

When she turned a corner, she encountered a group of microbes that were a lot smaller than the ones she had just seen.

AIDEN: "Lactobacili, be careful."

"Ma'am, what are you doing here? This is a dangerous area for civilians"

MINERVA: "oh I'm sorry. Who are you??'
A brave looking microbe introduced himself as the leader of this group of Lactobacilli.

"The invaders are resistant to everything we've thrown at them so far. They're disrupting our ability to produce beneficial compounds like short-chain fatty acids. So we've gone underground"

Minerva frowned as she listened to his account. Apparently, the rise of antibiotic-resistant bacteria had gotten to a point where it was affecting entire microbial ecosystems, tipping them into chaos.

"What caused this?" Minerva asked. "Can I help?"

The Lactobacillus hesitated before responding: "Overuse and misuse of antibiotics by your kind have made these invaders stronger than ever…so…no…you've done enough…"

Minerva felt a pang of guilt as she realized the truth of these words. Antibiotics had been one of humanity's greatest medical achievements. But their widespread use had come at a cost.

"Have you seen my father, he has grey hair and glasses, and travels in a Micronaut… ?", she asked the Lactobacilli.
"I'm afraid not ma'am", their leader replied.

They parted ways. Soon Minvera noticed more signs of imbalance: once-thriving colonies were reduced to shadows of their former selves, and an eerie silence where there should have been vibrant biochemical communication. It was as if she'd walked into a ghost town.

"AIDEN," Minerva said grimly, "if this continues, what will happen to this community?"

AIDEN processed her question for a moment before replying: "The ecosystem will collapse. Beneficial microbes will be outcompeted by resistant strains that offer no value to their environment or host. This could lead to chronic inflammation, nutrient malabsorption, and increased vulnerability to disease."

"...so….bad things?"
AIDEN: Yes, very bad things."

Minerva sighed heavily as she surveyed the damage around her.
But she was determined not to leave without answers. She grabbed her micronaut-research-kit and started gathering samples for further analysis.

“AIDEN,” she said as she worked, “we need to understand how these resistant strains are spreading so quickly—and what we can do to stop them.”

All of a sudden, a rush of movement swept through the streets of Gut City.

The ground beneath her feet started to tremble, she looked up to see a gigantic wave of partially digested food particles surging toward her like a big sludgy tsunami.“
AIDEN!” she shouted frantically.

AIDEN: “Nutrients! They are being transported deeper into the gut. Hold on!” MINERVA: “Aideeeeeeen!”

Chapter 3: Another smoothnami!

Minerva blinked a couple of times before noticing her entire body was covered in some sort of funky-smelling, yellowish ooze…

“AIDEN,” Minerva whispered, scanning her surroundings, “why do my clothes taste like bananas…and where are we?”

AIDEN: So right now we are in the small intestine...
“This is the Peyer’s Patches region—the immune system’s outpost within the gut..”
Oh, and that yellow stuff that’s on your clothes.. I believe that is some kind of banana smoothie.

Minerva marveled at what she saw: clusters of immune cells stood guard along the intestinal walls of her sister’s body, like glowing sentinels surrounding a mountain valley.

Soon enough, several bacteria were starting to approach her, carefully. It was almost as if they were trying to tell her something. She noticed certain bacteria were releasing small molecules into their surroundings.

AIDEN: “These are bacterial metabolites, short-chain fatty acids like butyrate, acetate and propionate. They’re produced when microbes ferment dietary fibers.”

Minerva moved closer to one of the glowing fortresses to see how these metabolites were received by the immune cells.

“AIDEN,” she asked, “what do these metabolites do?”

AIDEN: “They’re important for maintaining balance.Butyrate, for example, helps regulate inflammation by signaling to T-regulatory cells, key players in calming overactive immune responses.”

Minerva nodded. “Peacekeepers?”

AIDEN: “Kind of… Without them, inflammation could spiral out of control. Additionally, butyrate serves as a crucial energy source for the cells lining the colon, which are called colonocytes. This energy provision is vital for maintaining the integrity of the gut barrier. Do you copy?

“Yeah, I copy.”

As Minerva ventured deeper into this region, she noticed a network of tiny vessels branching out from the intestinal walls.

AIDEN: “They’re part of the gut-immune heart/kidney axis.Metabolites produced here don’t just stay in the gut; they travel through these pathways to influence distant organs.”

"So what we eat doesn't just affect our gut—it impacts our entire body?" Minerva asked.

AIDEN: “Exactly”. Humans and microbes have co-evolved for millions of years. Early humans relied on microbes to digest fibrous plants and extract nutrients they couldn’t process on their own. Do you copy?”

“Yeah…I guess I copy. “

Minerva smiled unwillingly, thinking about this ancient relationship. “And in return for feeding them through our diet, they help us regulate our immune systems and protect us from disease?”

AIDEN: “Now you’re getting it,”“It’s a symbiotic relationship—one that has shaped both human evolution and microbial diversity.”

MINERVA: “You are about to give me another lecture, aren’t you?”

“Fiber-rich diets promote beneficial bacteria that produce anti-inflammatory metabolites like butyrate. In contrast, diets high in processed foods or animal fats can encourage harmful bacteria that produce pro-inflammatory compounds.”

MINERVA: “I have to admit: It is pretty incredible how something as simple as what we eat can decide whether this place lives or dies.”

AIDEN. “Yet understanding these relationships is not straightforward. The complexity of this ecosystem makes it difficult to draw conclusions without rigorous study - remember your problems with biological mathematics?”

“yes….” she replied grumpily

AIDEN: “We see the effects… but understanding the mechanisms—that’s where research becomes so important. Researchers must decode these interactions step by step—through observation, experimentation, and collaboration across disciplines.”

Just as Minerva prepared to document her findings on microbial metabolites and their role in regulating immunity, a sudden tremor rippled through the outskirts of Gut City. “What’s happening?” she said as she struggled to stand still on the wobbly surface

AIDEN: “It looks like you sister just had another sip of her smoothie. Nutrients will soon be flooding this region, and therefore: microbial activity is surging.”

MINERVA: “dammit Sis, you couldn’t wait for like another hour!?”

Before Minerva could finish her thought, she was caught up in another acid torrent of fluids and food-chunks tumbling on their way to the small intestine.

Finally, the current slowed, dropping her in an area teeming with both microbes and immune cells. It looked like they were talking to each other, but they were speaking in a code even her translator couldn't crack.

AIDEN [soft] Behold: the challenge researchers face nowadays. Decoding these interactions requires careful observation, experimentation… and patience."

MIVERVA: Speaking of patience….I'm running out of time!

Minerva had already been here for 8 hours, which meant her father had been here twice as long already. And she had gotten no closer to finding him.

She sat down, cleaned her glasses and wiped some of the slime off her face.
"…….Ugh!"

Suddenly, out of the corner of her eye, she saw a familiar shape that showed no resemblance to anything you would expect to find in the microbiome. A human shape.

FATHER: "I never liked banana smoothie either, kiddo. But, at least your sister's eating something."

MINERVA: "Dad!"

Chapter 4: It's not rocket science

"Dad! What are you…how are you…where…"

As Minerva struggled to get whole sentences out, her father pulled her up by her arms and said: "let's go kiddo, the clock is ticking. By the way: what took you so long?"

Almost immediately, her dad started walking, which meant she was supposed to follow him, even though she had no idea where he was going.

He read her mind: "we're going to where I left my Micronaut. It's stuck between a bunch of fibers. And I need your help."

A sigh escaped from his grey beard as his eyes met his daughter's… He realised he was the reason she was down here. Yet, he could not work up a simple 'thank you for coming after me'.

"Do you see that?" her father asked her instead. He pointed at a hub of immune activity. triggered by microbes…..: "that's the ileum."

In front of her, thousands of molecules were zipping by like messengers delivering urgent news. Immune cells, responding to microbial signals in real time. It looked insanely complex. Pure chaos. But beautiful and awe-inspiring still.

MINERVA: "wooh…how do researchers even begin to study something this….interconnected?"

Her father replied: "Good question. But I think you already know the answer? it's about testing hypotheses, and gathering data. Drawing conclusions ~~from such complexity~~ requires careful design, collaboration, and constant refinement." ~~It's about asking the right questions,~~

“Let’s say you’re trying to map a vast and dense forest.

“If you want to understand its geography, there’s no point in studying each and every individual tree. Yet, you might learn more from looking at a single leaf. But if you did that, you’d be walking through the forest all day long.”

Minerva let that sink in for a bit.

“Most people see science as a collection of facts,” she said aloud. “But really, it’s a process—a way of asking questions and testing ideas in collaboration. Something that never stops. And It’s about trusting that *process*? ”

AIDEN: “Correct, “And at its core is the principle of falsifiability: for an idea to be scientific, it must be testable—and capable of being proven wrong. Researchers design experiments not to confirm what they already believe, but rather to see if what they *think they* know is actually true.

“ An her father added, all of this of course requires a lot of knowledge on biological mathematics. Speaking of which: did you finish studying for your test?”

“Dad, Seriously?”

--

They paused near a cluster of microbes Minerva was able to identify as *Fecalibacteria; they were,* feasting on a bunch of fibers and releasing glowing molecules. “Wow, look at…!”

AIDEN: yes, they are producing metabolites: butyrate and acetate.

“Okay dad, humor me: “We know the metabolites that these little guys are producing, regulate inflammation, right? — but how do we prove it?”

“By isolating variables,” her father explained. “Researchers might compare gut samples with and without these bacteria or use animal models to observe how inflammation changes when butyrate is introduced.”

“But that’s just one piece of the puzzle,” Minerva replied without *fully* understanding what he’d just said.. “What about diet? Genetics? Environmental factors?”

“That’s where things get difficult,” her father admitted, impressed with his daughter's line of questioning. “The microbiome is influenced by so many variables that it’s nearly impossible to study one factor in isolation without losing sight of the bigger picture.”

“Good science isn’t really about proving yourself *right*. It’s about trying to prove your ideas *wrong*.”

“Right”…Minerva said.

"Ah, there it is,” her father said as they approached his Micronaut.
“Wow….okay, you weren’t lying about it being stuck” MINERVA said, “this thing is wedged in for real”
“Allright, just give it a little push from over there, will ya?. On three, you ready?”
1, 2, Push!

[we hear a loud slimy pop] The micronaut switches on, we hear a familiar humming]

“Listen Minera, *my* clock is running out….you still have about 9 hours left. So… I want you to continue looking for a pathogen. We need all the tissue samples we can get if we want to figure out what’s making Fleming ill.

Minerva knew he was right, but the idea of being left here by herself, after only just having found her dad, scared her.

“There are still a bunch of places in her microbiome we haven’t even looked at. So, I want you to take the Gut-brain axis freeway, and ride it all the way to the lungs.”

Her father took her hand.

“Finish what I started.”

Minerva swallowed and repeated her mission [whisper]: Navigate the bloodstream, follow the Gut-Lung Axis to the lungs. Collect as many samples as you can find. You can do this"

"That's my girl." He gave her a quick, tight hug. "Meanwhile I'll analyze the samples we’ve already gathered.”

He climbed into the Micronaut and looked her in the eyes. "Be careful. And be brilliant. See you on the other side!”

The Micronaut lifted off and, in an instant, disappeared into the microbial haze, leaving Minvera by herself once again.

"Okay, AIDEN," she said. "Call for my Micronaut. Find the nearest access to the bloodstream and plot a course to the lungs."

AIDEN: "Okay, Minerva. Your micronaut should be here in a minute or so. Scanning for optimal vascular entry point. Calculating route based on known immune cell trafficking patterns and metabolite gradients..."

The Micronaut showed up and Minerva got in. She took a deep breath, squared her shoulders and gave AIDEN the launch command: “punch it”! Before she knew it, the device slipped through the thin vessel wall and sped away…

Chapter 5: Deep breaths everyone

Minerva’s micronaut was shooting through the gut-lung axis, at a dizzying speed. A blurred stream of plasma carrying giant, disc-shaped red blood cells and larger, blob-like white blood cells surrounded them.

AIDEN: "Maintaining position relative to the vessel wall. We are now in the liver vein system, proceeding towards systemic circulation."

She wasn’t paying attention to what her AI companion was saying. Her thoughts were with her father, with whom she had just parted ways, and with her sister.

Fleming was running a fever, AIDEN had informed her. Minerva could tell, as she felt tiny beads of sweat dripping along her face, fogging the inside of her helmet. Things were starting to heat up down here.

"Approaching pulmonary circulation," AIDEN announced after what felt like ages. "Entering capillaries in the lung."

The vessels narrowed. The stream of rushing liquid had vanished and so had most of the traffic. With a soft vibration, the Micronaut slipped back through the vessel wall and settled onto a moist surface.

Above them arched a vast, beautifully curved ceiling made of delicate, paper-thin cells. Minerva opened the Micronaut hatch and climbed outside, carefully, quietly, as if the whole place could be torn in half by the softest of sounds.

AIDEN: oxygen levels are sufficient.

Minerva opened her visor and took a deep breath. For the first time in hours, she felt….Air.

AIDEN "Welcome to the Lung Mountains Minairva,"

[we hear winds]

This place looked nothing like Gut City. The atmosphere was thin and cool. Mountainous structures, connected by delicate tissue bridges, surrounded her. An oil painting in soft shades of blue and grey.

“AIDEN,” Minerva asked, “what makes the lung microbiome unique compared to the gut?”

“The lung microbiome is smaller and less diverse, but it plays a vital role in maintaining respiratory health. It interacts directly with the air we breathe, adapting constantly to environmental conditions."

…

Some of the mountains were covered in dark dust particles, like black snow on a mountain ridge.

Nearby, clusters of friendly *Streptococcus mitis* huddled together. Minerva had read about these little guys and knew they were part of the commensal lung microbiome — and that their purpose was to help maintain balance by keeping harmful pathogens in check. These ones, however, seemed “tired” and stressed-out.

She took out her sampling device and started to climb a nearby slope. Immediately she began gathering tissue in the hopes of finding traces of a pathogen / a clue to discovering what was causing Fleming’s illness..

“I’ll document the *S. mitis* condition and collect those dust bits,” she informed AIDEN. The dark particles shimmered slightly under the light of her scanner. They looked like pollution—tiny bits of something that didn’t belong here. The nearby lung cells were swollen and red, showing signs of irritation.

AIDEN "You might want to close your helmet again Minerva. You don’t want this stuff to get into *your* lungs as well.

In areas where the dust was thickest, bigger, rougher-looking microbes appeared. So-called ‘Opportunistic pathogens’. Their numbers were growing quickly. .

“In clean environments, they remain dormant / or are outcompeted by commensal bacteria. But pollution gives them the edge, an advantage. Am I right? I’m right aren’t I?”

AIDEN “You are correct. Hold on, I’m cross-referencing your samples with your father’s earlier gut data and Fleming’s medical history. ….. There appears to be a strong connection. Fleming’s immune system is somehow compromised, she cannot handle the pollution like a healthy human would.”

AIDEN informed her that the Enterococcus faecalis that had taken over the colon, were actively disrupting Fleming’s immune defenses.

The air pollutants in the lungs were making matters even worse. With Fleming’s defenses down, pathogens were having a field day.

Minerva looked up at the fine black dust clinging to the lungs. Around her, a handful of friendly microbes were struggling to survive.

“So it’s both,” she whispered. “Inside and outside... ….it’s all connected.”

AIDEN`; “The pollutants coming from the outside world are hurting her lungs. But inside her body, the balance in the gut microbiome was already disrupted. Harmful antibiotic resistant bacteria took over. These two problems combined are what’s making Fleming ill - and what’s keeping her from getting well…

"And this thing is bigger than just Fleming, isn't it, AIDEN?" she asked quietly. "This pollution.. the antibiotic resistance problem..."

AIDEN’s silence answered her question.

‘Just as our lungs need clean air to thrive, our planet needs healthy ecosystems to survive…”

AIDEN “You humans… you saw it coming. And yet you did nothing to prevent it. The AB resistance. The damage to the environment. You just let it happen. And you’ve failed to fix things ever since.

Minerva froze. AIDEN had never sounded like this before. Were AI’s even capable of being angry with humans?

On her descent, she clenched her fist, feeling a heaviness in her chest, and at the same time, a determination. She *knew* AIDEN was right.

Minerva gently tapped the casing in which she had gathered the blackened lung tissue samples. A plan began to form in her young mind. A plan to fix things.

“This pollution is bad, obviously” Minerva said. “But the real fight is in the gut, isn’t it?”
AIDEN: That is correct.

“Then we need to go to the Colon Cave System ASAP.

Minerva connected her sampling device to the Micronaut to try and upload and transmit the data to her father in the lab.

Unable to connect

“Dammit”. Okay. Crap. Well. As long as we can get this Micronaut out of here, we can secure our findings. Plot a course, AIDEN. Take us to the Colon Cave System!.”

Chapter 6: Big problems, small solutions

Warning: Exit window closing - 54 minutes remaining.

"Minairva, We are on course to reach the Colon Cave System shortly. But, we have less than one hour before the Micronaut is restored to its full size. ~~Do you think we have enough time to gather samples?!!”.~~

Copy that AIDEN, Minerva replied with a knot in her stomach. I don’t know if we’ll make it, but we don’t really have a choice, do we? We need those samples’

She could tell her AI companion was struggling with her response. Of course there was a choice. There is always a choice….

Finally, they reached Fleming’s colon. Minerva stepped out the Micronaut. The heat, caused by Fleming’s fever, was becoming unbearable.

But what she saw stopped her cold. The tissue around her was raw and swollen, glowing red with inflammation. Slimy towers of biofilm clung to every surface. Swarms of aggressive, drug-resistant bacteria crowded the Colon Caves and were attacking the body’s few remaining immune cells. Not a friendly microbe in sight. Gut City and the colon caves below its surface had become a warzone.

"AIDEN, identify the most harmful microbe"

"Multiple pathogens detected. Resistance genes present in all major clusters. We need more samples."

It’s like looking for a needle in a haystack.

Minerva carefully approached the battlefield, crouching down behind a big lump of slimy tissue.

The bacteria were too busy fighting to notice her. The biofilm that surrounded their clusters glowed in an unfriendly manner.

One of the bigger, scary looking clusters was coming her way. It was almost close enough for her to touch.

That’s it, she thought. *That's what I need to sample.*

Minerva took her sampling device, reached out her right arm in disgust and gently scooped a piece of biofilm into the device’s container. Now, all it needed to do was process the tissue and confirm that this *was* in fact, the proof she needed.

But the moment her device made contact with the biofilm, the cluster reacted like a stirred wasp nest. In fact… all life forms in The Colon Cave System seemed to have been alarmed.

The microbes stopped whatever they were doing. And all of a sudden, they weren't distracted anymore. They had an unwanted guest…

Holy [PEEP]!
AIDEN!, we need to get out of here!

A violent swarm surged toward her. Minerva wanted to run back to the Micronaut, but the path was blocked.

Enzymes and toxins were approaching her rapidly, hitting both her suit and ship in waves, frantically crashing against the hull.

Warning: Exit window closing - 7 minutes remaining.

"Minerva, Shield failure is imminent. Contamination detected!"

"Is the ship infected?!"

"Not yet. Countermeasures holding. But not for long."

The sample device in Minerva's hand was flashing, telling her the data was valid. Yes! She couldn't believe her luck. She had gotten what she needed!

Somehow, Minerva managed to get into the Micronaut and close the hatch, having smashed hostile microbes left and right in an attempt to clear a path.

"Get us out of here AIDEN!" she shouted, "quickly!"

Warning: shield failure. Unable to launch. Power core integrity compromised.

Her ship wouldn't move an inch. The power core had been damaged. Lights were flickering on and off. Systems were failing.

Warning: Exit window closing - 3 minutes remaining.

"AIDEN?! What do we do?!"

AIDEN: There is one last option, MINERVA. I can relay all my remaining energy to the shields and thrusters... "

Okay, well let's go then, what are you waiting for!?

AIDEN: The thing is: I won't survive… I will lose all power, permanently. There's no way to back me up down here. This will frie my circuits down to my very last nanofiber…

No!" Minerva cried. "WHAT?"

AIDEN: This will save you and the data, Minerva. It's the only way. You have to initiate the EMERGENCY Protocol, quickly. Get yourself and the micronaut out of here.

The console lit up: EMERGENCY PROTOCOL: INITIATE, it said. Minerva let her index finger hover over the button.

AIDEN: Do it, Minerva, You don’t have a choice…."

Minerva’s eyes teared up. She couldn;t believe she had to say goodbye to her trusted companion. But then, she thought of her sister…and pressed the button.

"Goodbye, Minerva. Be logical... and brave." [voice flickering]

Warning: integrity window closing - 1 minute remaining.

I’m going to make it. I’m going to make it. I’m going to make it.

[we hear loud noises]

Did I make it?!

“You made it,” her father said.

Minerva stumbled out of the Micronaut, sweaty and breathless, clutching the sealed sample container to her chest. Her father helped her climb out of the machine.

Minerva stared at the blank console. ~~where AIDEN once spoke.~~

Her father put his arm around her. "Thanks to AIDEN, thanks to you, now we know what we're fighting."

Minerva thought of the lungs, full of pollution from the outside world. And the gut, damaged by antibiotics from the inside. Two environments - both out of balance.

"It's not just Fleming," she said. "This problem is so much bigger."

"Yes," her father agreed. “Which means the solution will have to be equally big”.

“Or…microscopically small, she said.”

Epilogue - A New Mission

Fleming was still weak, but improving.

The bacteriophage treatment her sister and father had designed specifically for her, a special virus that hunts and destroys specific bacteria, seemed to have its effect.

Minerva knew her journey wasn't over. Somewhere in the world. In the soil. In the ocean…It could be anywhere. Any place, any city. Or even inside another lifeform, cures were hidden .

The key to finding a solution could be hidden in the environment's own microbiome. And she was going to find it.