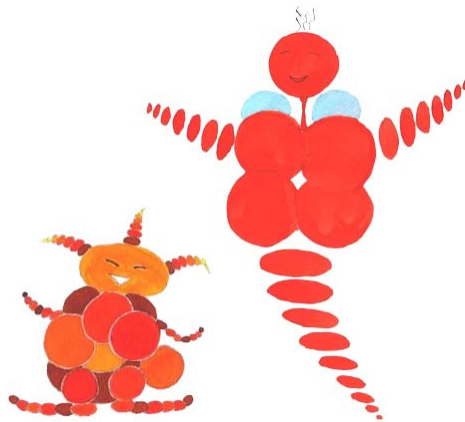


journey into a tiny world

the adventures of Globin and Poietin

text and illustrations

by Vivienne Baillie Gerritsen and Sylvie Déthiollaz



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My first thoughts go to Sylvie who wrote this tale with me, and to the laughs and the fun we shared during the year 2002. They also go to our lovely friend Ariane Bourjault who delighted many children by reading it to them, and infusing beauty and magic into Globin and Poietin.

Thank you Andrea for reading through the translation carefully, and making all the suggestions I needed.

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translated by Vivienne Baillie Gerritsen

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For Paule and Theo

And Luna



Lily will soon be ten years old. Most children would be excited, counting the days that go by far too slowly. Or busily preparing their birthday party and writing a long list of the presents they would like. But Lily has lost interest this year. She's not well. She hasn't been well for weeks. Sitting on a little brick wall, she's been watching her friends play in the school playground. "If I don't get better soon, Ben will end up beating me on roller skates and Alice will be skipping faster than I can."

In the past few days, things have got even worse. The tiniest of efforts exhausts her. When she gets out of bed or stands up, her head starts to spin and her heart begins to beat as though she has just run a marathon.

“Come and play Lily!” her friends shout. But she can’t. Her legs feel like rubber, and her body feels so heavy.... As heavy as... As heavy as... Oh! As heavy as Mont Blanc that she can just make out over the rooftops.

She hasn’t been going to gym classes for weeks either. And her school results are not very good... She never did have great marks but the last ones have been pretty bad. In short, life has become a nightmare.

When she got home that day, Lily slumped down in an armchair and cried her heart out. “I’m so tired I don’t feel like doing anything anymore,” she wept.

Her mother knelt down beside her. Lily was looking very pale. Even her freckles had disappeared. And now she wasn’t eating either. It was time to go and see Doctor Cruikshank again. “We’ll go and see the doctor this afternoon Lily,” her mother said. “This has been going on for too long now.”

Lily sat with her elbows on her knees and her head between her hands, staring at the wall in Doctor Cruikshank’s waiting room. She didn’t budge. Nor did her pigtails which looked as limp as she felt. She was so unhappy that a little boy started to giggle and make faces at her. His mother grabbed him by the ear and whispered a few sharp words, and he continued to play with a little red car on the floor, glancing at Lily from time to time. Under other circumstances, Lily would have stuck out her tongue, and

glared a glare that would have made the little boy cringe. But all she could manage was a little twist of her nose.

“Lily!”

It was her turn. She rose on her weak legs and dragged herself into the Doctor’s surgery.



“So, Lily? You’ve not been feeling well, I hear?” he asked, noticing how white she looked. “Tell me what’s wrong.” Lily was usually such a chatterbox that it was difficult

to get a word in edgeways but today she hardly said anything at all. The doctor looked worried.

“We’ll have to take a blood sample,” he said to Lily’s mother over the rim of his glasses. “And you must come back tomorrow for the results.” Lily became even whiter as she imagined the huge needle pricking deep into her arm. Doctor Cruikshank guessed her thoughts. “Don’t worry Lily, you’ll feel nothing at all,” he reassured her. “My assistant is a real magician.”

The following day, Lily and her mother paid another visit to the Doctor’s.

“You are anaemic Lily,” Doctor Cruikshank announced. Lily looked blank. “Anaemic means that you don’t have enough red blood cells in you.” Lily turned to her mother and burst into tears. “Don’t cry. We can make you better again. The thing is, your kidneys are being very lazy at the moment.”

“What does that have to do with my blood?” sniffed Lily.

“Your kidneys make red blood cells.”

“Red blood cells?” asked Lily, wiping away her tears.

“Yes. Usually, your blood is full of red blood cells. These are the cells that catch the oxygen in the air you breathe. And oxygen is like wood you put onto a fire. It keeps us going.”

“Is that why we breathe faster when we run?” Lily was beginning to show her usual interest in things.

“Yes... You could say that. You need more oxygen inside you because your body is working hard.”

“Mmm.” Lily blew her nose loudly.

“Once your red blood cells have caught the oxygen, it has to be sent to every different part of your body. From your head to your toes. And...”

“And my blood vessels are just motorways to get the oxygen to different places!” interrupted Lily.

“Yes! Precisely!” exclaimed Doctor Cruikshank, delighted that Lily had understood. “That’s how oxygen is delivered to your brain, to your muscles, to your heart and even to your kidneys.”

“But what does my body do with this oxygen?” Lily asked.

“As I said Lily. Oxygen for us, is like a log of wood you put onto a fire. It keeps us going.”

“But food keeps us going too,” added Lily.

“Yes, we need food too. We need food *and* oxygen to keep us going.” Lily sat back satisfied with Doctor Cruikshank’s explanation. “So you see, if you don’t have enough red blood cells, the oxygen you breathe in is not going to find a way around your body, and everything will just slow down.”

“And that’s why I’ve been feeling so tired…”

“Yes. That’s why everything you do, makes you feel tired.”

“How are you going to make me better Doctor? Are you going to fill me up with red blood cells?”

“Yes. But you’re going to make them.”

“How?”

“I’m going to give you some medicine that will help you make more.”

“Oh?” Lily looked up at Doctor Cruikshank, wide-eyed.

“But it’s medicine that we’ll have to inject into you every day.” The doctor took Lily’s hand. “And you’ll have to stay in bed for some time.” Lily said nothing. The idea of missing school was not so bad but the idea of a daily injection was less appealing.

“What’s the medicine called?”

“E-ry-thro-poi-etin,” said the doctor slowly. “It’s a molecule. A very small one. Normally, your kidneys make it but for the time being they’re not. Erythropoietin will help your body make more red blood cells and you’ll be skipping and hopping to school faster and higher than you ever have before!”

“Wow!!!” Lily clapped her hands.

Instead of getting better, things just seem to be getting worse. It’s been three days since Lily last visited the doctor. She’s had three days of injections but she’s still feeling

just as tired and down in the dumps as ever. Her friends come to see her every day, bringing presents and laughter with them. Cheshire – her tomcat – spends his time stretched out on her bed, purring and nuzzling up against her just as she loves... yet nothing seems to cheer her up. She just dozes her day away, drifting in and out of wild, colourful dreams.



She can't wait to get better. She's dying to play elastics with Susan. She promised she would tie Leo to a tree, and she misses the chats and the giggles she has with her friends behind the teacher's back. But she's stuck in bed.

The medicine Doctor Cruikshank prescribed for her is on her bedside table. And, as far as she is concerned, it's not doing her much good. Surely he should be giving her more... The worst part is that she has to wait for him to come to give it to her.

"You can't swallow this," he has told her. "Since the molecule is a protein, your stomach will just digest it and that would be of no use to you. We have to inject it straight into your blood."

Really...? What if she took one gulp? Just one? It wouldn't do her any harm... And she would get better faster... Lily glanced at the bottle of medicine. Only one gulp...

There wasn't a sound in the house. She sat up in her bed, grabbed the bottle and swallowed the lot in one go...

There seemed to be no end to Poietin's fall as she plummeted down a twisty, narrow, pitch-dark tunnel. She could feel its slimy walls squeezing against her, pushing her down further still. Then the tunnel suddenly widened and she landed upside down with a thump on a flat clammy surface. Stunned, she had a look around. She seemed to have ended up in a cave. A huge moist cave... that was very warm and... very smelly...



"Where am I?" she wondered, gathering her senses and holding her nose. "It's not at all the way I was told it would be." She rose and flicked some gooey stuff off her leg.

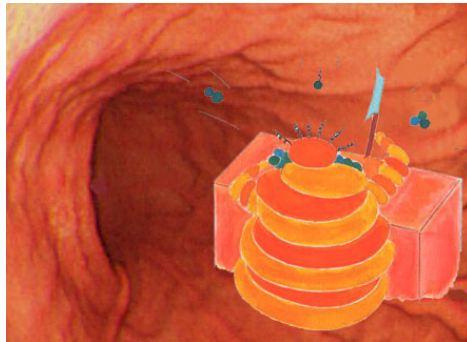
"Right. No time for dreaming. I have a job to do!" And she slipped a second time and fell with a splotch on her bottom. Furious, she rose and rubbed her bruises.

"Who's there?" rang out a thunderous voice.

"Who's there? Who's there?" repeated its echo.

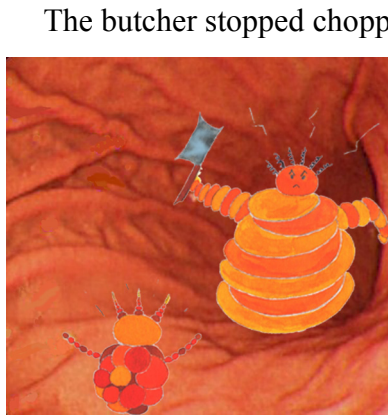
Too frightened to answer, Poietin didn't say a word. For a while, nothing stirred. And then she heard a chop ... chop ... chopping sound. She tiptoed to where the noise was coming from, which seemed to be

from behind a mound. As she approached, the sound grew louder and louder. She had a look over the top... and was relieved to see another protein. Just like herself. A giant one but a friendly one, she was sure. “Perhaps he can show me the way” she wondered as she clambered over the top and skipped towards him. But her carefree skip soon turned into a terrified hop when she realised what the giant was up to: he was hacking away at another protein. Albumin! She was lying outstretched on the table! Lily must have eaten an egg that morning. Albumin lives in the white of an egg and here is the butcher protein cutting her into tiny little bits!



Poietin didn't know what to do. Stay? Run away? If she hung around too long, he might do the same to her! But where could she run to? She had no idea where she was. Trembling with fright, she managed a “Hello...” The only answer she got was a grunt. And the butcher protein continued his gruesome task. Perhaps it's just his way of saying hello, thought Poietin. So she cleared her throat and continued: “Excuse me, could you

tell me where I am?” He grunted a second time. Poietin watched him chop methodically, wondering what to do next. She decided to try once more. “Excuse me... Sir... I’m on a mission... quite an important one... Lily’s life depends on it actually...”



The butcher stopped chopping and, holding his axe high above his head, he turned round to face Poietin. Who gulped. Besides the little bits of Albumin left on the table... and the butcher... there was only her. She began to feel very uneasy and stepped backwards slowly, terrified that he might decide to make little bits out of her too.

“You seem to be awfully busy... Perhaps I should...”

The butcher moved towards her. Poietin ran off as fast as she could, searching for a place to hide. But the only place that seemed promising was barred by this monstrous protein. And the thought of even trying to make her way back up that awful slimy and stinky tunnel made her feel sick. “I must hide. I must find a place to hide,” she panted. “Shhhhhhhhhhhhhhh pok!” The butcher’s axe brushed passed her and hit the ground close to where she was standing.

“Ooooooooooooooooooooooh”, squealed Poietin, as she ducked to avoid the sharp blade. A second chop came whistling past her, followed by a third, and a fourth as the monster got closer. There was nowhere she could run to. She had reached a dead end. There was no escaping the butcher’s axe! She was about to become a minced protein!

Just like Albumin! The axe hovered above her head. “It’s the end of me!” screamed Poietin. She closed her eyes and waited for the blade to fall...



...when something caught hold of her, hoisted her up and dragged her through something soft and squooshy. Too scared to open her eyes, Poietin stood motionless, still trembling with fright.

“Open your eyes, silly!” said a cheery voice. So Poietin did. Very slowly. She was standing in a dim and narrow tunnel; far narrower than the one she had just fallen down. “Hello!” continued the same joyful voice. “I’m Globin!”

A beautifully rotund protein greeted Poietin. “Well! You arrived just in time!” gasped Poietin. “Thank you! Without you, I would be crumbled me by now... Who was that awful protein anyway?” she asked Globin, as she picked at lumps of slimy ooze that were hanging off her.

“Oh, that was Pepsin,” answered Globin unconcerned. “It’s his job. He spends his day chopping up food.”

“But why?” asked Poietin.

“He’s part of what you call digestion. No one could do without him. When food arrives in Lily’s stomach, he’s the one who chops it up...”

“... like poor Albumin...”

“Yes... like Albumin... And then the different chopped up parts are dispatched to different parts of the body.”

“What for?”

“They’re used as building blocks...” Poietin looked puzzled, so Globin continued. “They’re either used to replace parts that need to be renewed or to build new parts.”

“Ah... I see...” Poietin didn’t really but she had other things on her mind. She hadn’t quite got over the shock of almost becoming a sliced version of herself.

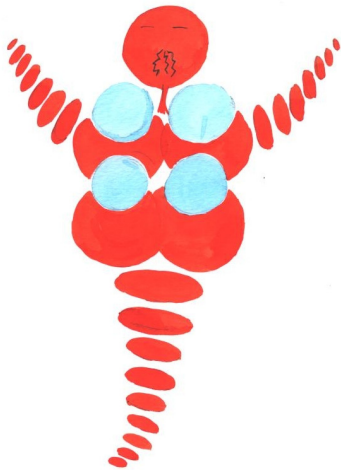
Globin decided against any further explanation too and had a good look at Poietin. “Who are you anyway? You’re very lucky I was around!”

“I’m Poietin. And... I’m on... a mission... A rather special one actually,” she said importantly. Globin didn’t seem impressed in the least, so Poietin continued. “I have been sent down here to find the bone marrow where Lily makes red blood cells because she’s not making enough it seems.”

“Ah! Well it’s about time too!” exclaimed Globin. “I’ve been waiting for you! I’m ABSOLUTELY exhausted!”

“Oh? Why?” asked Poietin.

“Have you no idea who I am?” enquired Globin, vexed. Poietin didn’t, no. But daren’t say so. So she said nothing at all. “I’m a haemoglobin,” Globin said emphatically, and she twirled around once to show herself off. Poietin tried to look impressed. “I live inside red blood cells and catch the molecules of oxygen that arrive in Lily’s lungs. And then I escort them to other parts of her body.”



“Look!” said Globin and she turned to show Poietin a backpack full of oxygen.

“Wow!” said Poietin. “You’re carrying four of them! Aren’t they heavy?”

“They’re as light as air!” laughed Globin and she performed a second pirouette. Then she turned to Poietin and said gravely: “You’re nowhere near where you should be, you know...The bone marrow you’re supposed to find is millions of molecules away from here. You’d better get started... In the meantime, I’m off! I’ve also got work to do! It was lovely meeting you! Really! Good luck!”

“Hey! Don’t go!”

“What?!”

“You can’t just leave me like this!”

“Why ever not?”

“Help me find the bone marrow!” Poietin didn’t want to be left on her own again and added a polite “Please?” for good measure.

“Sorry. I can’t. I don’t have the time. You’ll have to find your own way,” retorted Globin dismissively.

“*Do* you, or do you *not* want to help Lily?” implored Poietin.

“Of course I want to help her! What a silly question!”

“Well, think then. You deliver the oxygen, right?” Globin nodded. “Now, if you help me find the bone marrow then I’ll be able to make more red blood cells, and you’ll be able to deliver even more oxygen...” Globin listened intently while Poietin continued her train of thought “...which could make a hero out of you...”

“Mmmm... You may have a point there,” murmured Globin twirling and whirling a little more. “And everyone will be talking about me... And I’ll be invited everywhere... Opening galas and signing autographs... In purple ink... And I’ll be on TV... And the radio... And journalists will write about me in magazines, and newspapers... And someone will be bound to write my biography... And...”

Poietin broke her off... “And if we don’t get going, Lily might become seriously ill...”

“Off we go!” shouted Globin. “There’s no more time to lose!” She grabbed Poietin and the two of them disappeared down a blood vessel.

What's that distant thump we can hear?" asked Poietin.

Globin listened. "Oh that... It's Lily's heart beating. It's busy pumping blood into her arteries and blood vessels. That's how we made it here Poietin! It's great transport, don't you find?"

Poietin didn't answer; she was listening to the rhythmic thud. "It's awesome..." She shivered.

"No, it's comforting I find," retorted Globin. "I feel safe as long as I can hear that beat Poietin. Without Lily's heartbeat, it would be dead silent around here. Honest." Globin sat down to admire the view and listen to the swoosh of Lily's blood rushing through her heart.

"Do you really know the way to the bone marrow Globin?" Poietin was beginning to doubt Globin's confidence.

"Kind of..." Globin sat back and closed her eyes.

"Kind of? Or kind not of?" queried Poietin impatiently.

"I am acquainted with lots of Lily's bones..." answered Globin. "Although..."

"Although what!?" snapped Poietin.

"Although I'm not sure they have the marrow we're looking for..." Poietin lost her temper and stamped her feet. "I'm still young you know," Globin continued, unperturbed. "I've still got tons to discover... A body is a vast place... Really very vast..." Poietin sat down and sulked. "You know what?" Globin said after a while.

“What?”

“Let’s go and visit Insulin. She lives in Lily’s pancreas. I’m sure she’ll know where we have to go. She’s always travelling!”

Globin led Poietin towards the pancreas which – Poietin remarked – looked just like a comma. Before Globin had the chance to comment, a protein came splashing down and showered both of them with blood.

“Uugh!” cried out Poietin in disgust and wiped off the drops that had splattered all over her.

“Oh! Great! Well done Insulin! Thanks! Look at us now! What a welcome!” shrieked Globin, infuriated.

“What?” asked Insulin. “Oh... Sorry... I didn’t see you...” She muffled a giggle.

“I bet...” moaned Globin.

“Aw come on! I was only having some fun! Things aren’t so great at the moment you know! Look at my factory; it’s going from bad to worse. I’m really worried, you know...” Insulin nudged Globin. “So, I get fun where I can find it...”



“Well, that’s precisely why we’re here Insulin! Here. Take a molecule of oxygen for the factory. I can’t give you any more... Sorry... I have to share it out.” Globin pulled a bubble of oxygen out of her backpack and gave it to Insulin. “And look who’s here...” Globin pointed to Poietin, certain that Insulin would recognise her instantly. But she didn’t. “It’s Poietin...” urged Globin. Insulin didn’t react. “Poietin... Insulin... You know who Poietin is, don’t you?” Insulin shook her head. “She’s here to solve our problem...” Insulin raised her eyebrows but said nothing. Poietin was beginning to feel not only embarrassed by the situation but also a little out of place. “Poietin’s got to reach the bone marrow. Naturally, I immediately offered my services and told her that I would lead her there...” Poietin couldn’t believe her ears, Globin had said no such thing “...but I just need you to tell me if we’re heading in the right direction,” carried on Globin.

“What would you do without me?!” exclaimed Insulin paddling playfully in a puddle of blood.

Poietin grabbed Globin. She wasn’t going to put up with any more of the protein’s arrogance. “Come on! Let’s go and ask someone else. Who does she think she is?”

“My name is Insulin! IN-SU-LIN...” Insulin repeated slowly, bowing graciously before the two proteins. “I am the molecule that collects sugar in the blood. Hence,” she added professorially “I am AB-SO-LUTE-LY essential.”

Poietin tugged at Globin, eager to get away. “Poietin...” hissed Globin. “Wait! She’s a terribly pompous protein but she’ll tell us where to find the bone marrow we’re looking for... Be patient.” Globin turned to Insulin and smiled one of her sweetest smiles.

“And,” continued Insulin, “...once Lily has swallowed sugar, it goes straight from her stomach into her blood. And what I do is open doors for the sugar to get into Lily’s liver, her muscles, or any other tissue where there is fat...”

“Do we really have to listen to this?” said Poietin, bored to tears.

Globin nodded. “Just wait... She always goes on like this...”

Insulin frowned. Poietin sighed. “The sugar,” Insulin continued, “...will then be used to provide Lily’s body with all the energy she needs... Or...” she added theatrically, “it will be put aside and used later. Ever heard of diabetes?” Insulin sniffed importantly.

“No. No, I haven’t. And I’m not sure I want to thank you,” answered Poietin hurriedly, pulling Globin. “We really have to get going you know...”

“Well,” continued Insulin ignoring Poietin once again, “...diabetes is an illness that occurs when there is too much sugar in your blood.”

“Why? Have you lost the key to the doors?” enquired Poietin.

Insulin ignored the comment, paused, cleaned one of her nails and then said: “Anyway, what bone marrow is it you’re looking for? There’s bone marrow in every bone. And whichever bone marrow it might be, it’s nowhere near here. I would have gone with you but I’m not heading in the same direction...” Globin and Poietin said

nothing, expecting Insulin to continue. Which she did: “You might like to find your way to Lily’s heart first, and from there you’ll be able to find your way.”

“Great! Come on! Let’s go!” Poietin tripped over Globin in her haste. “There’s no time to waste! Bye! See you around!” Globin picked herself up, shrugged her shoulders at Insulin and ran off to catch up Poietin.

“That’s not the right way Poietin!” Globin shouted after her. “We’ve got to take a vein. Only a vein will lead us to Lily’s heart. If we dive into an artery, we’ll be fighting against too strong a current and just get exhausted!”

“What a maze...” moaned Poietin. “I can’t understand how anyone finds their way in here at all...”

“It’s a question of habit,” retorted Globin. “How about taking the bus?”

“The bus?”

“Yup. The bus. There aren’t many around at the moment but it won’t be long before one comes along.” Globin led Poietin to a red cell stop. “You know Poietin, you shouldn’t have been impatient with Insulin. Everyone’s a little on edge these days...” Poietin fiddled with something gooey that she had just picked off her leg. She rolled it into a little ball and flicked it onto Globin, who gave her a friendly punch. The two proteins sat down and waited for a red cell to come along. It took ages. Luckily though, there was plenty of room when one did arrive, so they hopped in and seated themselves comfortably.

“Hold on! Next stop: Lily’s heart!”

The thump of Lily’s heartbeat was deafening. “Look out! We’ve arrived!” shouted Globin.

“I can hear that!” squealed Poietin, holding her hands against her ears. “It’s like being inside a huge bell!”

They held onto their cell as tightly as they could; the din had become unbearable.

“Have you got any earplugs?” shrieked Poietin. “It’s like being...” She paused. “Oooooooh!” she gasped. She was so taken by the scene that she forgot about the thump that shook them at regular intervals.

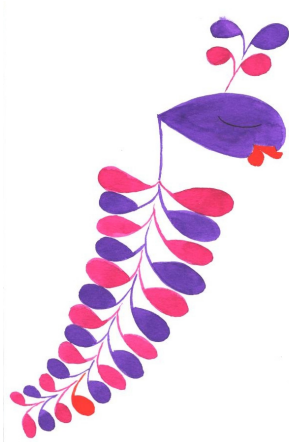


The two proteins stepped off their red cell and marvelled at the view. Towering above them was a huge dome which shuddered rhythmically. Hundreds of intertwined ropes spanned the colossal pillars that lined the walls. Everything seemed to curve and twist, and then join in the dome’s centre.

“I’ve never seen anything like it...” whispered Poietin.
“Never...”

“Who’s there?” sang two voices – one low, one high – in chorus. Poietin and Globin looked at each other. Neither of them could make out where the voices were coming

from. Then two proteins appeared from nowhere and slid down one of the pillars. One of them was very tall, and the other, very small. The tall one landed on Globin's foot.



"Ouch! Can't you be more careful Myosin?" Globin squeaked.

"D'you know who they are?" asked Poietin, astonished.

"Of course I do." Globin was sitting, cradling her foot.

"That," she pointed to the tall protein, "is Myosin. And Actin," Globin nodded in the direction of the short protein "is his cousin." Poietin found the short protein charming and winked at him.

"We are inseparable!" the two cousins chanted.

"Inseparable?" repeated Poietin.

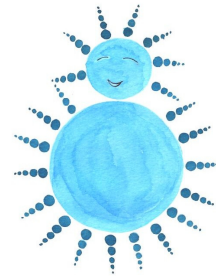
Myosin and Actin nodded, vigorously.

"They work together Poietin," explained Globin. "Actin and Myosin live in Lily's heart. They belong to the muscle that makes her heart beat, and pushes the blood through her arteries."

"Oh..." Poietin looked deeply disappointed.

"What's wrong? You look so upset all of a sudden?" asked Globin.

"Oh...nothing..." She sat down and made knots with something slimy.



“Globin?” enquired Myosin.

“Mmm?” answered Globin distracted, still a little concerned about Poietin.

“You wouldn’t have a bubble of oxygen by any chance, would you?”

“Yes I do!”

“Thank you... Thank you so much. Listen to Lily’s heartbeat. It’s so slow. It’s so weak, it can hardly push her blood around her body anymore.”

“Aw... Come on, Myosin!” wailed Globin dismissively. “Look at the bright side of life!”

“The bright side of life eh? How long did it take you to wait for a red cell? Was it on time? Was it?”

“Yes it was, wasn’t it Poietin?” Globin turned to Poietin. “We didn’t wait a long time, did we?” Poietin didn’t know what to answer. *She* remembered having to wait ages for their red cell to arrive. “In fact,” Globin continued, “Poietin and I even managed to catch a red cell ahead of schedule. Didn’t we?” added Globin as she handed Myosin a little oxygen. Poietin, numbed by Globin’s dishonesty, said nothing. Instead, she turned to myosin.

“Myosin...”

“Yes?”

“We’ve got to find the bone marrow that makes red cells. Do you know where it is?”

Myosin and Actin shook their heads. Neither of them had any idea. However, they suggested taking the aorta, and then the carotide artery which would lead Globin and Poietin to the brain. “And if there is one thing that can give sound advice, surely it must be the brain!” chanted the two molecules. “It’s that way!” Actin and Myosin both pointed towards a passageway whose entrance was blocked by what looked like a doorflap.

Before anyone had time to react, a huge wave of red cells came swooshing down in their direction. Myosin and Actin managed to grab hold of a pillar but Globin and Poietin were dragged away by the strong current and just managed to hear Myosin shouting as they went hurtling down the artery: “Let the wave guide you!”

The two molecules heaved themselves onto a red cell and slumped inside.
“So?”

“So what?” asked Poietin.

“Well, what do you think of this kind of transport?” enquired Globin. “Deadly, no?”

“I suppose so... I’m feeling a little... cell-sick...”

“That’s because you’re not used to it.” Globin stretched and relaxed. “Comfortable too...” She yawned loudly. “I could do with a nap. How about you?” Poietin, still a little pale, nodded meekly.

“Watch out!” screeched Poietin.

“What?!”

But before Globin had time to realise what was happening, they hit a junction where the aorta branched off into a small vein. Globin managed to hold onto the cell but Poietin was thrown overboard and disappeared. She reappeared moments later, gasping for breath and was swept into the narrow vein. Globin, still inside the cell, vanished down the aorta. “Poietin!” she screamed. “Poietin!” But there was no answer. Horrified, she raced after her, leaping from cell to cell against the current. Breathless, she reached the junction where Poietin had first disappeared, managed to leap onto the other side of the junction and let the current carry her through the smaller vein.

It was dark inside. Lonely. And narrow. And the journey seemed endless.

“Hey!”

Globin turned to where the voice was coming from.

“Here! I’m over here!”

It was Poietin. Globin couldn’t see her but her voice seemed to be coming from a blinding light. She found Poietin sitting on the edge of something pink and soft. Her feet were dangling over a crevice, which was surrounded by long slender pylons that swayed in a chilly breeze. “Isn’t it beautiful Globin?” marvelled Poietin. “Isn’t it?”

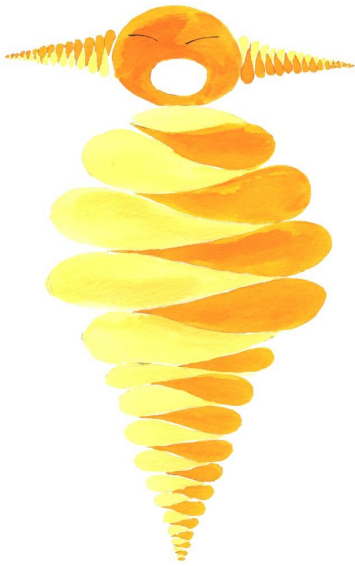
“Yup... There’s a cold breeze too... We’d better not stick around here too long Poietin...” announced Globin.

“Why ever not? You always have to spoil thi...”

A deep, menacing voice interrupted them and hollered: “Hey you two! This is *not* a place for sunbathing! You’re on a construction site! Get out of here! Fast!”

“Who...?” gulped Poietin.

“Shut up and run!” hissed Globin. “There’s no time for questions!”



But Poietin was mesmerised. Whatever it was, was at least three times their height and careering towards them at a frightening pace.

‘Move Poietin!’ screamed Globin. “It’s Collagen! He’s never in a good mood. In fact, he’s usually in a very very bad mood.”

“But what’s wrong?” asked Poietin. “Are we bothering him here, or what?”

“Yes! Look, move and I’ll answer any questions you have when we are a safe distance from him.”

“What’s he building?” Poietin wouldn’t budge.

Exasperated, Globin marched back to where Poietin was still sitting. “Have you no idea where we are?” Poietin shook her head. “You’re sitting on the edge of a wound.” Poietin jumped to her feet. “That’s what the blinding light is. It’s the light on the other side of Lily’s skin. It’s daylight... We’re standing on the outside of Lily...”

“Wow... That’s awesome...”

“Awesome or not, Poietin, it’s not safe...”

“What about the swinging pylons Globin?” queried Poietin, still taking no notice whatsoever of Globin’s warning.

“They’re not pylons. They’re hairs... And this...” Globin patted the softness of what they had been sitting on. “This is Lily’s skin.”

“Ooooooh... It’s so nice and soft. I wish I was made of skin.”

“It’s only because it’s Lily’s skin. Not all skin is nice and smooth like hers.”

“Oh?”

“No.”

“Whose skin is less soft then?”

“An elephant’s for instance. Or even Lily’s mother’s. The older you get, the less soft it is. And let’s not mention the wrinkles...”

“Wrinkles?”

“Yeah. Wrinkles. They’re like trenches that riddle your skin. Never get lost in a wrinkle Poietin, you’ll never find your way out.”

“I see...” Poietin didn’t, but didn’t feel it mattered much. “What is Collagen doing here?”

“Well... Thanks to him, Lily’s skin is strong and resistant. When a hole is made in her skin...”

“A hole? What would she make a hole in her skin for?”

“She doesn’t do it on purpose! But when she falls off her bike and cuts her knee for example, it makes a wound in her skin. And you have to mend the wound as fast as possible.”

“Why?”

Globin rolled her eyes. “If the wound is not healed, too much blood will pour out of it.”

“Ah... So Lily’s skin is only there to stop the blood from getting out?”

“Not only that... It also keeps nasty creatures from getting in, like bacteria that love to infect blood. And Lily’s skin is teeming with them.”

“Urgh!”

“As long as they remain on the outside of Lily’s skin, she’s all right. It’s only when they manage to get in that she could get very ill. That’s why a wound has to be closed up as quickly as possible!”

“I see...” Poietin looked up. “I also see Collagen...”

“Out of here!” boomed Collagen. “Unless, of course, you would like to get stuck with the rest of us...”

“Oh no!! Quick Poietin! Or we’ll get caught in the scab! ” cried Globin horrified, and she caught hold of Poietin.

“I know it might not be the right time to ask...” said Poietin sweetly.

“Ask what?” snapped Globin.

“...to ask Collagen the way to Lily’s brain...”

“I don’t believe it, Poietin!” Globin turned to Collagen. “Help us Collagen!” Collagen heaved both proteins away from the wound and flung them into another blood vessel.

“Wow! That was a close one!” sighed Globin relieved. “We could have been imprisoned there for life!”

Poietin looked at her companion, confused: “How? I don’t understand.”

“Is there anything you understand?” moaned Globin. “Were you never taught anything at all Poietin?”

“Yes. But not what you were taught,” retorted Poietin, peeved.

“True...” said Globin pensively. “You see, when skin is wounded, not only does it have to be patched up quickly but the blood must coagulate otherwise Lily would lose too much.”

“And what does ‘cogoolet’ mean?”

“Not ‘cogoolet’ silly... ‘coagulate’... that’s when the blood becomes harder and forms a kind of cork so that no more blood can flow out of the wound.”

“And how does blood coo...ga...loot..?”

“Coagulation is like a huge net that forms in the blood and catches all the red cells.”

“And where does the net come from?”

“Oh that’s Fibrin who makes the nets. And if we had stayed where we were, we’d have got caught in Fibrin’s net.”

“And we would never have been able to escape?”

“Nope... Never.” Globin paused. “Gives you goose pimples, doesn’t it?”

“Goomples?” repeated Poietin.

“Oh never mind,” Globin said impatiently.

“D’you think we’ll ever make it, Globin?” Poietin was beginning to feel less confident.

“I don’t know... We didn’t even have time to ask Collagen where the bone marrow is...”

“So where are we going now?” murmured Poietin.

“If we carry on in this direction, we’ll reach Lily’s brain. That’s the best information centre we’ll ever be able to come across.” Poietin nodded and the two proteins wandered off, in silence.

Moments later, they heard the shrill sound of a whistle. And before they had time to get out of the way, a squadron of proteins rushed past knocking both of them over, seemingly in pursuit of a tiny little creature that looked like a sea urchin.

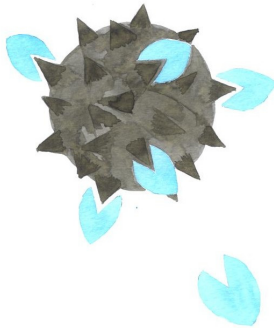
“What in Lily’s body was that?!” gasped Poietin.

“That? Oh... They were Immunoglobulins...” Globin clapped her hand over Poietin’s mouth. “Don’t even try to pronounce it...” Poietin shook her head. “They’re chasing after the spiky little ball in front.”

“Why?”

“Because they fight off viruses and bacteria.”

“The ones that get into Lily’s body when she’s wounded?”



“Yes... Although, they have lots of ways of getting in. Wounds are just one. The spiky ball you have just seen race past, is a flu virus. Nothing serious really... But they had better catch it because it’s not the right time for Lily to catch a cold.”

“I had no idea there were so many different proteins!” said Poietin.

“You’ve seen nothing yet. There are thousands and thousands and thousands!”

“Thousands?!”

“Yup... Thousands... In Lily. In her mother. In all the people she knows...”

“In everybody then? Does everyone have thousands of proteins?”

“Yes they do. And so do animals and plants...” added Globin. “And none of them look alike. They are all different shapes and sizes, and do loads of different things. We’re part of a big family, you know.”

“What? Are we cousins?” squeaked Poietin, terrified.

“Eeem... Not cousins... Really... But we’re made out of the same stuff.”

“Stuff?”

“Yes. Stuff.” Poietin was expecting more of an explanation.

“What kind of stuff Globin?”

“Do we really have to go into this?”

“I want to know. It’s my right to know, isn’t it?”

“I can’t believe you made it here in the first place with the little you *do* know...”

“You still haven’t told me what we’re made out of.”

“You don’t want to know Poietin. It’ll just make things complicated.”

“I’m waiting...”

“Fine. Amino acids.”

“What?”

“I told you, didn’t I?”

“You told me what?”

“That you didn’t want to know.”

“That I didn’t want to know what?”

“Stop being so stubborn, will you!” Globin stamped her foot.

“All right. We’re made out of amino acids. And I’m not going to ask you what these are...but I want to know where all these proteins are made...”

“Inside Lily’s cells.”

“What’s a cell?”

Disheartened, Globin took Poietin by the arm. “Come with me. Let’s get back onto a red cell and I’ll explain one or two things to you, okay?” Poietin followed Globin, eager to learn more.

Once comfortably seated, Globin pursued. “You see...all Lily’s organs, like her heart, her kidney and her liver are made out of cells. Cells are to a body what bricks are to a house.” Poietin was listening intently. “In every cell, there are machines that make all these different proteins I told you about.”



“But how do the machines know what protein they have to make?” interrupted Poietin.

“I was getting there,” said Globin doing her best to stay calm. “Every machine reads a kind of recipe that they get from a book that is called ‘DNA’ ”

“DNA?”

“Yes... DNA... Ever heard of DNA?” Poietin shook her head.

“Let me give you an example. You’re a protein, all right?” Poietin nodded. “And you are made in Lily’s kidneys. Okay?” Poietin nodded again. “The problem with Lily is that her kidneys are not working the way they should be and she’s not making enough of you. That’s why she had to swallow you instead...” Poietin looked puzzled. “You were in the medicine she swallowed, remember?”

“Ah yes! She had to take me as medicine because she can’t make me at the moment!”

“Yes!”

“Now I get it... I knew I had to get to the bone marrow. I knew I was here to help Lily make red blood cells. But I wasn’t sure how to go about it...”

“She doesn’t have enough at the moment...”

“But she had enough before... Where have they all gone?”

“Despite your appalling lack of knowledge, you’re pretty bright, aren’t you?”

“Why d’you think they sent me down here in the first place?” snapped Poietin, piqued.

“The thing is red blood cells don’t last a lifetime. So they have to be replaced.”

“So that’s why...” Poietin was beginning to understand the true purpose not only of her mission but also of her existence.

“Yes. You’re off to find...”

“...stem cells in Lily’s bone marrow...” interrupted Poietin, “...which multiply and then become red blood cells.”

“Precisely. Thank goodness we’ve got that straightened out...”

“It’s very quiet here,” whispered Poietin. “Where are we?”

“We’re very close to Lily’s hypothalamus,” whispered back Globin.

“Hippo what?”

“Hypo! Hypothalamus! It’s part of Lily’s brain.”

“What’s it so quiet for?”

“She must be sleeping. The hypothalamus is a very very important part of her brain.”

“It *must* be with a name like that...”

“It’s the part that tells her when she’s tired, or when she’s hungry. It even has something to do with her feeling happy or sad.”

“Cool...” Poietin had a look around. “It looks like a cauliflower...”

“Oh! Here’s Orexin! She’s the one who looks after Lily’s appetite and sleep! Ooooooh, Orexin!”

“Mmm? Someone call me?” yawned a tiny protein with just as tiny a nightcap on.

“It’s Globin!”

“Mmm? Who?” Orexin noticed Poietin standing behind Globin.

“Have you got nothing better to do than sleep?” Globin asked.



“There’s not much going on here at the moment. I’ve been waiting for reinforcement for days. In between times I thought I might have a snooooooooooze...” she yawned again. Her nightcap fell over her eyes and she sneezed loudly.

“Bless you!” offered Poietin cheerily.

“Mmm...” Orexin paid no attention to Poietin who poked Globin in the back for attention. Globin turned to say something disagreeable, when Orexin asked: “Does anyone know why Lily’s doing everything in slow motion?”

“She’s anaemic...” answered Globin with her back to Orexin, and frowning at Poietin.

“That means her body is tired! That’s why she’s sleeping a lot!” chirped Poietin over Globin’s shoulder.

Globin turned around to face Orexin again. “This” she announced, “is Poietin...” and she stepped aside so that Orexin could see her. Orexin glanced at Poietin but said nothing. Globin continued “...and Poietin is looking for the bone marrow which makes Lily’s red blood cells.”

Poietin nodded enthusiastically. “And we thought you might be able to tell us where the bone marrow is since brains are supposed to be... well...so brainy...”

Globin pinched Poietin: “What she really wanted to say was we thought you might be able to help us find the bone marrow since you are very knowledgeable about many things...”

“Pfff...” huffed Orexin and yawned another huge yawn. She adjusted her nightcap on her head, put her hands on her hips and looked mischievously at the two proteins. “I’ll tell you where Lily’s bone marrow is if you let me show you something first...”

“Ooooooooooooooooooh nooooooooooooo!!!” pleaded Globin and Poietin. “There’s no time for games now Orexin!!!”

“Fine! Suit yourselves.” Globin and Poietin looked at each other. “But I won’t tell you where the bone marrow is then...” Orexin pulled her nightcap firmly on and lay down for another nap.

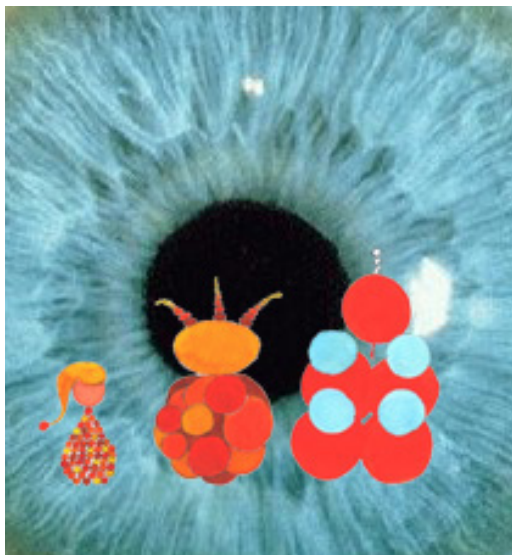
“For Lily’s sake, do something Globin!!” shrieked Poietin. “What kind of a protein is she? It’s a kick on her backside she needs! Lily could die because of her!”

Globin was marching up and down, holding her head in her hands, muttering something to herself. “Right! You win Orexin! Show us what you want, and then promise us that you’ll tell us how to get to Lily’s bone marrow.”

Satisfied, Orexin rose, skipped, hopped, twirled and whirled, and then said with a smile that Poietin would have gladly wiped off her face: “You’ll see... You’re going to love what I have to show you. And it’s not far either.”

The three proteins wriggled into the meanders of Lily’s brain.

“Be careful...” warned Orexin. “There’s a lot of electricity going around here and you don’t want to be electrocuted...”



She led Globin and Poietin to the entrance of a narrow tunnel, at the end of which they could see a bright light. “This is Lily’s optic nerve. Come on! Follow me!”

“Wait!” shouted Globin, afraid that this would take much longer than she had been expecting. “Where are you taking us?”

“To see Lily’s eye! Come on! You’ll be amazed!”

The three of them ran down to the end of Lily’s optic nerve where they reached a gigantic round hollow cavity, wrapped in a network of very fine blood vessels.

“Woooooooooahoooooooo!” gasped Globin and Poietin. “Magic...”

“Come here!” said Orexin, excited. “I want you to meet someone!” And she pushed her two friends to the front of a huge circular screen. The screen changed size constantly. Getting bigger. And then smaller. And then bigger again. It was like being in a very peculiar cinema.

“Cooooool!” Poietin was thrilled. “Can we see a film?”

“Welcome,” breathed a voice that seemed to emerge from the screen.

“Who’s talking?” asked Poietin.

“Cristalline...”

“Cristawho?”

“Cristalline...”

Globin and Poietin moved forward to see if there was anything behind the screen. “No. Here. In front of you...” Globin pointed to the screen. “Yes. There.”

“Perhaps it’s a ghost...” whispered Poietin, uneasy.

“Don’t be silly!” hissed Globin.

“I’m no ghost. I’m transparent. That’s all.”

“Transparent? That’s all?” whispered Poietin to Globin. “I’m out of here!” Orexin looked on amused. The voice continued.

“I’m the screen you see in front of you.”

Poietin turned to Globin: “How can she *be* the screen?”

“Shut up and listen Poietin!” snapped Globin.

“It’s not a cinema screen you can see, it’s a crystalline lens. Part of Lily’s eye. It’s like a window.”

“You can usually see through a window...” mumbled Poietin.

“What you can see is the world outside. It’s what Lily is looking at, at this very moment.” Poietin and Globin stepped forward to get a better look.

“Wow...”

“And depending on the curve of her lens, she can see properly, close up or not.”

“Just like a photo lens,” added Poietin.

“A what?” asked Globin.

“A photo lens.”

“How do *you* know that?”

“I read about it.”

“Where?”

“In a book.”

“Can you read?”

“Do you two never stop arguing?” asked Cristalline.

“It’s incredible!” continued Poietin taking no notice of Cristalline. “Look! We’re in Lily’s bedroom! And look there! It’s her chest of drawers and the mirror! And there! Her cupboard! And her window! Oh! Look at the cherry trees in the garden! Aren’t they lovely?”

“I told you, you didn’t want to miss this. Didn’t I?” said Orexin.

“Oof... I’m feeling sick again...” Poietin slumped down onto the floor.

“That’s quite normal,” said Cristalline. “You have to get used to it.”

The three proteins were admiring the view when a great big hairy monster with huge ears and a mouthful of sharp teeth approached, ready to pounce onto them. Globin and Orexin stepped backwards and fell on top of Poietin who writhed underneath.

“Run for it!”

“What was that?”

“Get off me!”

“Ha! Ha! Ha!” laughed Cristalline. “That’s Cheshire! Lily’s cat!”

Globin, Poietin and Orexin scrambled back onto their feet.

“Oh...” said Poietin. “It must be on the other side of Lily’s eye then...”

“Goodness! I was beginning to forget why we were here!” exclaimed Globin all of a sudden. “That was really fun Orexin. Thanks! We’ll come back! Promise! But now you’ve got to tell us how to get to Lily’s bone marrow. Please. Lily’s very ill...”

“Only if you solve this riddle...” teased Orexin. Poietin and Globin leaped at her, ready to strangle her. “All right. All right. Just having some fun!” she laughed. “Okay... The kind of marrow you’re looking for is called the red marrow...” Globin and Poietin listened intently, “...and you’ll find it in Lily’s pelvis.”

“Come on Glob! Off we go to Lily’s pelvis!” screamed Poietin.

“I haven’t finished,” continued Orexin, sharply. “I was saying you’ll find some red marrow in Lily’s pelvis... or in her ribs...”

“Her ribs! Her ribs! Come on Glob!”

“I still haven’t finished...” Globin and Poietin did their best to keep calm. “I was saying... In Lily’s pelvis, her ribs, or her breastbone.” No one said anything. “What are you waiting for?” continued Cristalline.

“Oh! You’ve finished?” Poietin asked, mildly surprised.

A disbelieving sigh seeped out of Lily’s lens.

“If I were you, I’d go to Lily’s pelvis. It’s where you’ll find the most red marrow,” advised Orexin.

“Oh no...” whined Globin. “That’s miles away!”

“Yup. But if you follow Lily’s spinal cord, you’ll be there in no time at all!”

Globin grabbed Poietin. “See you Orex and Cristal!” And they rushed off.

“Hey!” yelled Poietin, trying to keep up with Globin.

“What now?”

“You didn’t even ask the way!”

“Not to worry! I know where Lily’s spinal cord is. It’s not far. It’s what her brain is attached to. All we’ve got to do is go back to her hypothalamus.”

“Hippo what?”

Globin and Poietin reached Lily's spinal cord in no time at all. "Want some fun, Po?" asked Globin, enthusiastically. Poietin looked at her blankly.

"What? What's wrong? See Lily's spinal cord?" Poietin nodded. "Look! It's full of cords. Can you see?" Poietin nodded a second time and peered down. "These are nerve fibres."

"We're not going to go down these, are we Glob?" gulped Poietin. "It's awfully steep..."

"Yeah! Precisely! We can use the fibres as ropes! It'll be great fun! It's one beautiful long slide to Lily's pelvis. Come on!"

"I don't like speed..."

"Well here's a chance to get used to it!" Globin seized a nerve and disappeared with a joyful screech. "Grab a nerve Po! You're here to save Lily!"

Poietin shut her eyes, caught hold of a nerve and let herself slide down like Globin. Halfway down, she started to enjoy the whole experience, opened her eyes and screamed with glee the rest of the way.

"Careful!" shrieked Globin at the top of her voice. "Slow down!"

"How?" squealed Poietin.

But it was already too late. Poietin landed on top of Globin and they rolled over screaming with laughter.

“Come on... It’s not far now.”

The two proteins reached Lily’s pelvis, where they had to squeeze through the bone to get into the marrow.



“Hey! Her bone is full of holes,” said Poietin. “Fancy a game of hide and seek?” Globin shook her head. “Aw come on Glob... Just one game? Only one? One...?”

Globin wasn’t smiling anymore. “We’ve reached our destination. I’ve come as far as I can.”

“What do you mean?” asked Poietin.

“This is your part. This is why Lily

swallowed you.”

“Oh... I see...” Poietin shuffled her feet. “Are you sure you don’t want to come with me Glob?”

Globin shook her head.

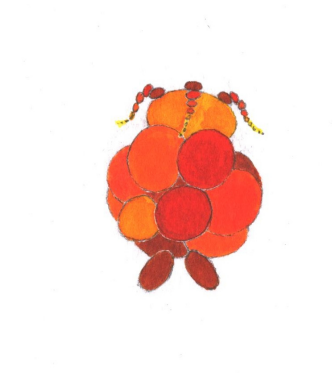
“I’ll miss you, you know.” Poietin wiped away a tear.

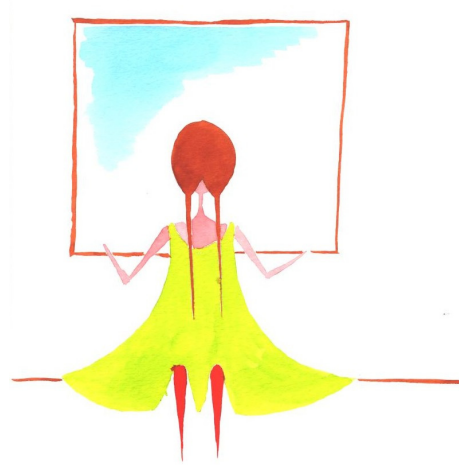
“I’ll miss you too Po...” The two proteins embraced each other warmly.

“Thank you Glob. Without you, I would never have made it here. I’ll never forget you.”

“We had fun! Didn’t we? Look at all my bruises!” said Globin giggling.

Poietin waved goodbye and disappeared inside Lily’s marrow. Moments later, Globin heard her shouting at the top of her voice: “Hey! Up you get you slothful cells! The holidays are over! No more lazy mornings! It’s time to work! All of you! And you too!”





Aaaaaaaaaaaaaaaaaaaaaah....” Lily yawned and stretched lazily in her bed. For the first time in days, she was feeling better. She looked out of the window. Spring had arrived. The daylight was soft, and flowers were already blooming in the garden below. Cheshire was lying in a sunny spot on the grass. The birds were whistling merry songs. New leaves swayed in the early morning breeze and a bumble bee flew past. Someone had left the garden gate open, and... and... What is it she could see skipping along the top of the stone wall? Lily rubbed her eyes. Could that be Globin and Poietin? Could it? She rose out of bed to get a closer look. And smiled.

the end

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