

The Three Laws of Robotics

0. A robot may not harm humanity, or, by inaction, allow humanity to come to harm.
1. A robot may not injure a human being or through inaction allow a human being to come to harm.
2. A robot must obey the orders given to it by human beings, except where such orders would conflict with the First Law.
3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Laws.

- Isaac Asimov (1920-1992)

Terra-Mis-formed

Era: Circa 1990

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The team was the same then as it is now. It consisted of two: Phil Talbot and myself, Linda Wick... unless, of course, you want to count the AI unit.

Five years we'd been together, soaring between Earth and the fourth planet in the system of Alpha Centauri, meeting the 'challenge of space'.

Phil and I had been hand picked for this expedition. We were chosen from a group of six competitors, by a panel of experts who examined our composure, creativity, technical knowledge, and manual dexterity. All the testing took place within a framework of fabricated enemies and synthetic battles.

I thought Phil should have failed the manual dexterity tests. He continuously lost control of his hands. They strayed to unexpected places, mostly on my body.

I never suspected for a moment that his wandering fingers would steal the show. It was a surprise when the panel announced that Phil and I would fly the probe. Our skills in inter-relating, they said, were a positive indication of success for the mission.

And right they were. The voyage would have been deadly without Phil's hands, because the 'challenge of space' is boredom.

To further reduce the monotony, Phil became a history buff. His forté, was the 1950s on Earth. To this day, he has a passion for bebop music and four-part harmony. Most of the material he studied was stored in the AI unit, so he and that old-bag machine developed an intimate working relationship.

Myself, I was into plants. You know? The kind with roots?

In spite of our fascinating pastimes, Phil and I were anxious to land. We were hoping for blue skies, whipped cream clouds, and bright sandy beaches. Phil was dreaming of drinking fermented juice under palm trees and watching type B robots quiver in hula skirts.

Don't knock it. Type B robots look pretty good.

The purpose of our trip was to evaluate the progress of the terra-forming operation on Planet Disney. The operation was the third of its kind - a sequel to modifications of Venus and Mars.

Robot exterminations had been frequent during previous operations, and the distance to Planet Disney was mind-boggling.

Consequently, our employer, Inter-Solar Development Inc., had modified its workhorse robot and produced the first Survivor: a robot specially designed to function under harsh conditions.

For over a hundred years, the Survivors had been modifying Planet Disney. Five months before our departure, Inter-Solar had every expectation that the planet was ready for occupation, that the atmosphere was successfully constructed, and the surface voluptuously blanketed with vegetation.

Then transmissions from the planet abruptly ceased.

I woke the morning of our arrival to find Phil dressed in my favorite color: green. (It's the color of independence - worn by plants that manufacture their own food.) He had brushed his brown hair to flatten it, but curls escaped around the nape of his neck, and flew like wings from the top of his head.

Even today, Phil's eyes are large and smiling. They're a picture window on the emotions that dominate his mind - the emotions that he cultivates like I cultivate plants. I would describe Phil as digital. He's either 'full on', or 'full off', either aggressively happy or morbidly sad.

That day, he was turned on. He danced around my float chamber, exuding positive vibrations.

"We're here. Planet Disney is hanging on the viewer, just the sweetest little pin-prick you can imagine. Come on." He tugged at my leg and yanked my sheet to the floor. The sudden force and reduced gravity of the ship sent me rolling against the wall.

I overlooked my cardinal rule of non-emotional behaviour and barked at him like a cheeky lunar rat. "Get your knobby knees out of here or you'll spend the day by yourself."

"Okay, okay. Why are you so miserable?"

"Me? Miserable? That's ridiculous. I hate feelings. You're the one that oozes emotion all the time."

His eyes grew wide. "You bet'cha," he stated then scuttled away, leaving me with no one to talk to but the AI unit, Lah-dee-dah. That's her name. I know, because I gave it to her. Unfortunately, she is humourless and uppity.

If you picture an electronic octopus whose arms run to the far corners of the ship, that's Lah-dee-dah. She figures she 'is' the ship, since she controls so many of its activities and is responsible for so much of its management. She also figures she's the co-pilot since she does Phil's calculations for him.

She has an 'extended' sense of self, you might say.

This day was no exception. When I miscalculated our position and established that we were half a light year from Betelgeuse, she mocked me. When I tried to change the air mix for the closed system gardens, she overrode my request. When I told her she was a know-it-all, she agreed. If I made an honest mistake and destroyed a small section of her bubble memory, I can only say she deserved it.

I knew the day was a total write-off when I decided to get dressed. I couldn't find matching socks, even though I looked in the dirty space suit bin.

And that was only the beginning.

When I finally joined Phil, he was into philosophy.

"Have you ever stopped to think, what a marvellous species we belong to?"

"Is this going to be a logical discussion?"

"Of course."

I shrugged. "People are okay, I guess. Plants are my favorite, though. Most of them don't kill living things in order to survive. They're ethically superior."

"No, really. You should have a little bit of enthusiasm."

"Enthusiasm is an emotion. I prefer logic."

"People are really admirable," Phil persisted. "Take something like terra-forming. How many species are there, that are capable of modifying the habitat of a whole planet?"

"Lots. That's what the terra-forming process is all about. People don't modify the atmosphere. The terra-forming organisms do it."

"But people control the operation. Only people have the reasoning ability and the logical skills to abstract a concept like terra-forming."

"Logical skills? People get all hung up on their emotions. If you want to see real logic, wait 'til you meet a Survivor Robot. Emotions are humanity's biggest problem. They're a stumbling block on the road to human perfection."

"No way. A stepping stone, maybe. Lots of animals have emotions, you know - dogs and cats for instance. Emotions must serve some useful purpose."

"Plants would have them if they were useful."

"Plants do. You can tell from their color. They're green with envy."

"Sure, Phil. Sure."

"Have you worked with these robots at all?"

"No."

"How do you know they're so logical then?"

"Because I read the file in the AI unit. The robots have a SREE."

"Okay. Fill me in. What does SREE mean?"

"It's an acronym: System for Rapid Environmental Evaluation. The SREE is an electrical-chemical system that's supposed to give the robot a real fast evaluation of his environment."

"So? What's the point?"

"Robots are expensive. With a SREE they can live in harsh environments where survival is difficult. It usually takes several minutes for a regular robot to draw a conclusion. A lot of them are destroyed while they're evaluating. When a robot needs to act quickly to avoid danger or gain benefit, it needs a SREE so it can make a fast decision."

"How does a SREE work?"

"Skip it, Phil. You should have read the SREE file. You've only had five years to do it."

Phil has been vaccinated against insults. "Five years is actually long enough. I've just been too busy 'oozing emotions'," he consoled me, "you know - about how I don't want to read it."

We squeezed one another, emotionally and physically, for another couple of hours. Eventually, the planet captured our attention.

"I've got it. Look at the view-screen." Excitement bubbled from Phil's voice. "See how fuzzy it looks." The brown body glowed like an out-of-focus photograph. "That's the atmosphere."

"No, it's not." I jerked forward in my chair and my voice rose like a rocket at launch. "The planet's naked."

"You're getting carried away, aren't you?" Phil asked, throwing my emotional reaction back at me.

He wasn't about to panic. I had cried machine-error once too often because Lah-dee-dah had adjusted my hydroponics mix.

"It does have an atmosphere," he continued. "Look at it." He pointed to the screen. Tiny wisps of vapour floated across the luminous surface.

I clenched my teeth then blasted him. "Brown. The whole blithering planet is brown."

"My hair is brown. My arm is brown." He bent his elbow and flexed his steel-hard muscles. "So what?"

"Water isn't. Plants aren't. They're green. The planet shouldn't look like this."

He stared at me, doubting my competence, enjoying himself.

My tongue flailed like a whip. "Brown means it's a lousy naked body."

"I'll wear long sleeves next time."

"Phil!"
"Made out of green fabric."
I shook my head and covered my eyes. He's a pilot, I told myself.
"Maybe the water is frozen in the polar caps," Phil suggested. "See the white patches?"
"I can't accept that. I'm going to use the element analyzer and check the atmosphere."
"It's done. The AI unit is running an analysis right now so don't you worry, chick. We'll
take -"
"I'm not chick. This isn't the 1950s. Don't call me chick. Call me ...chickweed, you...
you... you 'dandy lion'."
"Okay, okay."
Ignoring my frustration, Phil began to make rhythmic clicks and pops, be-bopping to
himself.
Guilt trip. "You bring out the worst in me," I explained. "Here I am, acting like an emotional
floozy. At least you have a ship to fly. What's an atmospheric engineer without water or plants?"
"I understand," he responded gently. His hands wandered off the console, in a most
uplifting manner.
<YOUR PRINT-OUT IS READY>, Lah-dee-dah interrupted.
"Your print-out is ready." My voice was syrupy enough to catch flies.
Phil accepted the printed sheet that Lah-dee-dah ejected and read it, his eyes growing
rounder and rounder.
Because his personality is digital, Phil can't sit half-way up his emotional spectrum.
Eventually, he slides to the bottom of his rainbow of feelings and finds the pot of gold missing.
When he finally spoke, his enthusiasm was as dead as the barren planet. "You're right.
No water. No free oxygen... mostly, just hydrogen and helium, and some nitrogen that combines
with the hydrogen to form ammonia."
Why?
Had the Survivors, like so many of their predecessors, ceased to function?
I left the control room. There was work to be done and I needed privacy. You know how it
goes. I didn't want Phil to feel even worse because I'd lied to him about reading the SREE file. I
hadn't actually finished it, you see.
In my float chamber, I called 'Specifications for Survivor Robots' from Lah-dee-dah's
memory, then flashed through several screens of material looking for the last heading that I
remembered. I found it. *HOW DOES THE SREE WORK?* flashed in bold letters across the
screen. I began to read in earnest:
*A Survivor Robot electrically evaluates each new experience as to whether the experience
is beneficial or harmful.*
"Example, Lah-dee-dah?"
Her voice was lilting and gay. She has no respect for my moods. <IF I WERE A
SURVIVOR ROBOT, WINDY LINDIE, THIS EXPERIENCE WITH YOU WOULD EVALUATE AT
NEGATIVE FIVE. YOU KEEP JABBING ME WITH YOUR FINGERS. GOT IT? A ROBOT
WOULD FIND THE JABS DISTRACTING, BUT OF COURSE, THEY DON'T AFFECT ME.>
Aren't we cutesy? I bashed the screen change button. New text appeared instantly.
*The result of this evaluation is summed with the results of previous (related) evaluations
and stored in the memory banks of the SREE.*
"Example?"
<I WOULD RATE MY LAST SESSION WITH YOU AT NEGATIVE 15. IF I HAD A SREE I
WOULD STORE AN AVERAGE OF NEGATIVE 5 AND NEGATIVE 15 IN MY SREE. GOT IT?
WHOLE THING AVERAGES OUT TO NEGATIVE 10.>
Bully, bully.
<ON A COMPARATIVE SCALE, PHIL WOULD RATE A POSITIVE 13. I MIGHT REMIND
YOU, WINDY LINDIE, THAT LAST SESSION YOU DESTROYED SECTION 3482 OF MY

BUBBLE MEMORY. OF COURSE, I DON'T ACTUALLY HAVE A SREE, AND I'M USER-FRIENDLY SO YOU'RE WELCOME TO DESTROY ME, IF YOU WANT TO.>

To want is to feel an emotion.

<BUT PERHAPS YOU SHOULD MAKE SURE IT'S OKAY WITH PHIL FIRST. GOT IT?>

This time, I 'caressed' the screen change button. I had an ideal to live up to.

If two robots meet for the first time, and the experience is beneficial, then each of them stores a positive value in the memory banks of its SREE.

The second time the robots meet, their SREES give an instant chemical readout of this stored value. Since the value is positive, the robots are motivated to relate to one another.

In other words, as a result of positive experiences, the robot's SREE will release a chemical that will reward the robot and the robot will continue seeking these experiences because the experiences enhance its survival.

"Example, Lah-dee-dah?"

<FOR A MACHINE WITH A SREE, RELATING TO SOMEONE WHO DESTROYS BUBBLE MEMORY IS NOT DESIRABLE. YOU HAVE TO REMEMBER THAT THE SREE IS THE EQUIVALENT OF A LAB FULL OF STORED CHEMICALS. GOT IT? FOR EXAMPLE, IF ONE OF THESE ROBOTS RUNS INTO YOU, WINDY LINDIE, AND YOU DESTROY SOME OF ITS BUBBLE MEMORY, THE ROBOT'S SREE WILL EVALUATE YOU AS BEING A REAL BELLIGERENT PIECE OF BALONEY.>

No doubt about it. She was getting to me.

I've come to the conclusion that Lah-dee-dah believes in the law of conservation of difficulty; if information isn't intellectually challenging, then it should be emotionally trying.

No way, was I asking for another example.

Similar evaluations are recorded in the SREE database re: other elements of the robot's environment, eg. weather, environmental chemicals, terra-forming organisms, etc.

The robot can respond instantly to almost any aspect of its environment because these running evaluations are maintained.

Without the SREE, there would be no running evaluation. The robot would have to perform the summation at the time the information was required. Also, there would be no chemical stimulus to motivate the robot to choose an 'appropriate' response and achieve survival.

<I DON'T HAVE A SREE, BUT MY MANNERS ARE EXCELLENT AND MY BEHAVIOUR IS ALWAYS APPROPRIATE. GOT IT? IF YOU WERE TO HAVE...>

I switched the terminal off.

Interesting robots.

Several hours passed. Some radio signals that we transmitted to the planet produced a response, directing us to a landing site. We concluded that the robots were still operational.

Unfortunately, Phil regarded this as a worst case scenario and (as you've probably guessed) was no longer be-bopping. He was into a different art form - scat singing based on four letter words. With the finesse of a helicopter pilot and the emotional stability of a bull, he dropped the ship through a jungle of steel girders and landed on a central plaza, close to the planet's equator.

The flare of our landing jets died and a swarm of robots approached the ship. We watched in the view-screen as the group surrounded its leader, and waited beneath our air-lock doors.

The robot spokesman was short - cherubic and innocent in appearance. An inane smile lit his face whenever one of his cronies looked at him and his optical collectors, which resembled human eyes, opened and closed enthusiastically.

Within his body, many low-density materials had been combined into miniaturized electrical, mechanical, fibre-optic and chemical systems. Five thousand kilometres of chemical tubing and a terabyte database were devoted entirely to the efficacy of his SREE.

His appearance was state-of-the-art human. He was covered in a plastic skin that had been manufactured at one of the chemical plants outlined against the planet's bloodshot sky. A tunic made from a soft-pink, chemically-based fabric, decorated his torso.

"Creators of the Survivor Robots, we greet you on this most auspicious occasion," he said, "that of your second coming."

"Oh wow." Phil picked up the microphone for the external sound system. "I'm coming out," he announced.

Immediately all the robots in the assembly began jumping, howling and screaming like teen-age humans at a concert.

The spokes robot waved them to silence, then addressed Phil. "No, sir. We couldn't ask that. It would be too inconvenient for you. You must allow me to wait upon you in your ship."

"I've been in here for five years. It's no trouble."

"Then allow me to come in, if you please, and discuss with you the dangers of the planet."

"Sure. Do that." Phil pushed the button that started the air-lock vacuum pumps then inched toward me and groped for the reassurance of my hand. "Do you think it's as bad as it looks, Chick?" He swallowed. "-weed."

The air-lock door dropped to the foot of the ship.

I smiled, grabbed him around the waist, and looked him in the eye. "It's okay, duck." He wrinkled his nose when he heard the name then an idea lit his eyes. I was disappointed at his reaction, but continued, "The Survivors are programmed to comply with Asimov's Three Laws. They have to be okay. Says so in the SREE file."

"The SREE file? Yeh."

Phil's chest heaved with anxiety. He drew away and swept his hair into a pointed ridge. "What do you think?" he asked.

"About what?" I looked at him suspiciously. I knew he was going to say something weird. That's how he relieves anxiety.

"I want this robot to treat us with respect, and I figure a 1950s image will do the trick." He turned his head so I could see the ridge. "It's called a duck-tail. What do you think?"

"It doesn't look like one."

He threw his hair backward in disgust, then jammed his nose next to mine. "Actually, I hired a robot detective to follow me around the planet," he taunted. "I'm a duck and he's a tail."

"And I say you're telling tales, duck-tales."

"Chill out, Linda."

"You're getting emotional again."

"And you're getting obnoxious."

No doubt about it. This trip was ticking Phil off, in spite of my company.

A moment later, the spokes robot stood before us, bowing repeatedly from the waist. "So wonderful," he bubbled. "A hundred years later, you return. The predictions of our memory banks have come to pass."

"You are too gracious," I replied, returning only one of his inclinations.

"So, XT 252, why isn't there any flippin' oxygen in the atmosphere?"

"If you please, I am called Wise One."

"XT 252. It's your model number isn't it?"

"I do not wish to be called by number, sir."

Phil glanced at me with blazing eyes then turned back to the robot. "Okay. That rules out Wise 'One'. Wise Guy, then. You robots have had over a hundred years to modify the planet. Why is there no oxygen or water in the cruddy atmosphere?"

"It's no problem, no problem. We're behind schedule by a little bit - fifty years or so, but you know how manufacturing processes go, sir."

"Fifty years? You must have missed every single deadline on the critical path."

"Well, a few, but don't worry. If you put on your atmosphere bags, I will take you on a tour of the facilities."

Phil looked at me. Atmosphere bags? Space suits. "I was hoping to wear my black leather jacket."

"Sure, Phil. Go ahead. Ammonia has an affinity for water and it'll combine with the moisture in your skin - form ammonium hydroxide - not to mention the lack of oxygen."

"So the atmosphere's as caustic outside as it is inside, hey?"

I ignored that.

"If you are coming with me," Wise One offered, "I'll clear a path through the crowd."

Twenty minutes later, loaded down with oxygen generators, and encased in 'atmosphere bags', we were marching across the rocky terrain of the planet.

Wise One gave a running commentary on the dangers of our hike and periodically skirted large sections of parched soil.

"The ground collapses fairly easily in a lot of places, so you have to follow me, sir." He waved graciously down the path.

"Why does it collapse?" Phil asked.

Wise One shrugged his shoulders, so I decided to play brain.

"It happens on a properly terra-formed planet, too, Phil. Ordinarily, moving-water levels the soil and makes it safe to walk on."

So why was this planet not properly terra-formed? Wise One's explanation was far from convincing. Could the robots have overcome the requirement of Asimov's Second Law of Robotics - the requirement that compelled them to obey the orders of human beings?

The afternoon was an engineer's dream. By the time Wise One returned with us to the Plaza we had studied a huge chemical facility that produced many of the components necessary for the maintenance and production of robot parts.

Phil was the pilot in the crowd and was flying high with a new learning experience. "I have to get back to the ship, get some of this recorded." Like a flash, he turned away from Wise One's tracks.

Wise One reacted instantly. He placed a plastic-coated hand on Phil's arm. "You're ten feet away, sir, from a ground cave.

Look." He picked up a rock, and heaved it toward a spot that looked like my great-great-grandmother's toothless gums. The ground collapsed leaving a circular hole ten feet in diameter and equally as deep. "You could have recognized that one from the wrinkles in the soil. Not all sink-holes are so obvious."

I was impressed. This Survivor had responses very similar to those of a human being.

Phil gave me one of his puppy dog looks. "Is there a discussion of sink-holes in that SREE file? On second thought don't answer."

"Why not?"

"I might sink into depression."

I groaned, rolled my eyes.

"Don't look so uppity. I'll bet you're relieved that I'm not upset."

"No way. Relief is an emotion."

The sky was a crimson sheet now, lashed with yellow streaks. It bubbled and swirled like a pot of boiling blood.

"A malevolent is coming," Wise One shuddered. "But we'll be safe in the chemical bar and I can get refreshment."

Phil looked at me through his space suit visor, a question mark written in the double grooves between his brows. Chemical Bar?

My upper lip curled in a smile. Chemical Bar?

"What's a malevolent?" I asked.

"It's a storm. The atmosphere picks up dirt particles and hurls them around, until the sky is black."

"Wouldn't the planet be better equipped if you had plants to hold the soil in place?" - and oxygen? my mocking mind asked.

"We have been experimenting, sir, with a new type of plant. You'll see in a minute."

Sir? This robot certainly wasn't into sexual discrimination.

Inside the chemical bar, my heart flipped like I'd slipped on a banana peel, because the room was filled with plants: large ferns and tiny hibiscus bushes, some blue spruce and a palm tree.

Phil knows what I like. He slapped my seat and smiled at me empathetically when he saw them. I maintained my decorum by tossing him a disdainful glance, knowing my charade wouldn't stop his advances another time.

Most of the robots in the room were human-mimics, but a few were the older bag-type and looked a bit like Phil and I in our space suits.

We side-stepped between tables and robots 'til we reached the back of the room. Wise One dropped onto a chair that was wrapped in spruce boughs, and the spruce tree instantly protected itself by withdrawing its branches. Weird bush.

On silent wheels, a waiter robot rolled to our table. The unit flashed with sparkling lights and its barrel body dripped with liquid refreshment nozzles. Wise One ordered a drink and the unit responded by flipping a glass onto the table and pumping a measured quantity of viscous fluid into it. "Do you wish to run a cumulative bill?" the unit asked.

"Not today." Wise One placed a sealed vial filled with an oily substance onto the table and the waiter unit returned a smaller, but identical vial.

"Thank-you. Please come again."

"I'd like a drink, too. What have you got?" Phil asked Wise One.

"Your metabolism is so totally different from mine, sir, that I cannot provide you with refreshment."

Phil's forehead wrinkled like a dried apple.

Right obedient robot, I thought to myself. So much for the second law.

Wise One drank from the container of foul smelling chemical, then turned to me once more. "Since your friend -" he pointed to Phil, "is physically aggressive, I assume that you are a type B human and he is type A."

"I'm a woman," I stated flatly. Type B indeed.

"Then I shall call you madam."

I thought about that as two robots (one obviously type A, the other type B) played a sensuous game of cat and mouse on the adjacent stairs. Eventually, they disappeared behind a powder blue door that opened off the landing, but still the odd giggle and smooching sound wafted down to the room where we sat.

As I studied their behaviour, my uncomprehending mind began to twist into a pretzel of confusion.

"Oh no. It's Needle Six."

I looked back toward Wise One. He wasn't interested in the amorous pair but his optical collectors bulged like miniature planets. He stood so quickly that he bumped our table, then he scurried across the room toward an old robot that drooped like an empty space suit in a chair.

My brain jammed as if an exploratory probe had electrically neutralized it. I kept looking at the old robot - drooping, drooping. Was he overwhelmed with emotion? How was this possible with a robot.

Solicitously, Wise One massaged the robot's arm and talked with him. Eventually Wise One returned to his seat, but the old robot was still morose and there was a down-turn in Wise One's mood. His optical collectors sagged, and his voice was empty. Drooping. Both of them.

"Your friend. Why is his head bowed?" I was struggling with a new understanding that was impossible to avoid.

"Needle Six? Because his RIT has disappeared again."

"His RIT?" I asked, peering with concern toward the robot's body, searching for a missing nameplate, a denuded bank of bubble memory, or a leaky lubrication system. "What's a RIT, anyway?"

"A robot in training. R-I-T."

"Ohh."

I tore my eyes from the old robot's anatomy. "Does it matter? If the RIT has disappeared, I mean?"

"Would it matter if your child ran away, madam?"

"We don't have a kid, and we don't want one either," Phil interrupted. "The ship's too small. Kids aren't engineered with on-off switches, so they're more trouble than AI units, especially in a bedroom."

"That's not the point, Phil." I turned again to Wise One. "Young robots are different from human children. They're programmed when they're manufactured. A RIT can look after itself."

"That is not entirely correct, madam. Let me explain robot reproduction to you."

"Reproduction?" I felt like a lunar rat at the foot of an elevator shaft - overwhelmed.

"Yes, madam. Reproduction."

"You'd better explain."

He leaned forward. "It's like this, madam. If you put a type A and a type B together, and they experience a rewarding association, their bodies release positive SREE chemical."

"I would have expected that."

"The chemical creates extra electrical stimulus, and we robots reduce this type of stimulation by plugging together."

"Just a little bit of old-fashioned hanky-panky," Phil piped out. Trust him to call a shovel a spade.

"Go on," I encouraged Wise One.

"Take a type B. First she installs a special foetal ROM inside her body then plugs together with a type A. Once they're joined up, the two of them can transfer information into the foetal ROM. Eventually, madam, they put the foetal ROM into a pre-fabricated robot body. Makes a RIT."

"See, that's what I mean," I interjected. "The foetal ROM is pre-programmed."

"The foetal ROM, yes, but not the SREE, madam. The SREE is part of the pre-fabricated body and isn't pre-programmed. That's why the RIT has to be supervised until it has enough experiences in its SREE to survive on its own. Otherwise, it could be eliminated very easily."

"Why bother with all this? Why not clone your offspring?"

"If each new unit were a clone, madam, then the offspring and parent would become inoperative under the same conditions. That could lead to the extermination of our population."

"But what about that old robot?" I asked. "I still don't understand why his head is bowed?"

"Because his SREE is releasing chemicals that burn his internals."

"The whole thing's a little silly," Phil interrupted. "You guys end up destroying yourselves."

"Usually we solve our problems, sir, long before any permanent damage is done."

Phil shook his head. "I don't see the point."

He couldn't. He hadn't read the file. I wouldn't. My seditious mind was refusing to face the implications of reality.

"SREE chemicals serve a couple of purposes, sir. One is instant information transfer. The chemicals tell us whether some environmental factor is beneficial or harmful, and they don't waste any time doing it."

"What if the factor is neutral?"

"Our SREEs ignore it."

"And the other purpose?"

"The chemicals serve as a reward-punishment system."

"You mean, if you do something that enhances your survival, the chemical is released and it rewards you?"

"Yes."

A nearby fern folded its fronds about the shoulders of the robot with the bowed head. The plant's caress touched my mind with a realization - light bulb quality.

The plants were robots, too.

"So, what is this chemical stuff?" Phil asked.

"It's called LE. Life enhancer. It neutralizes heat in our bodies - cools the working parts and warms the temperature of our body surfaces. D'you understand?"

"Go on," Phil encouraged.

"It does other things, too, like reduce fuel consumption and transmit electrical stimuli to the appendages. After an LE bath, we feel cool and invigorated."

"That's not what's happening to Needle Six."

"No. The RIT is a real benefit to my friend. Because the RIT is missing, Needle Six's SREE is releasing DD - death defender. It's acidic."

Was it possible that DD had damaged some part of the robots' circuitry that implemented the Second Law?

"So we're back to the same thing," Phil continued. "The chemical is dissolving his insides."

"Yes, but that is not all bad, sir. The fact that the chemical is harmful drives him to act, and the lubricating properties make his body function more smoothly. D'you understand? They speed up his internal power source, turn his secondary memory switches on - that kind of thing."

"Sounds really weird to me. I mean if the chemical secretions don't stop, he'll suffer permanent damage."

"And also loose the RIT," Wise One agreed, "so he acts quickly. Unfortunately, Needle Six can't go outside right now because of the malevolent, so he has to tolerate the chemical burns until he can. RITs can be a real headache, you know, sir. They run away at the worst possible times."

"I'd call it the best - a natural system of pest extermination."

Wise One frowned at Phil, then lifted his drink.

I sat, suspended in anxiety, slowly recognizing what my mind - my 'logical' mind was telling me. Was it possible that my emotions could be life-enhancing?

"One of the drinks served here, neutralizes our SREE chemicals, literally switches them off, sir."

"Is that what Needle Six is drinking?"

"Yes, but it is illegal for us to drink too much of it. If we do and we're caught, we'll be put into lock-up."

"Like - prison?"

Wise One nodded his head. "It's just too dangerous for a robot to deal with the social and physical environment of the planet when his SREE isn't functioning."

"You have police, then?"

"Yes. There are two over against the wall." He pointed to a couple of burly robots who stood like chess pieces, unmoving, close-mouthed, and sour. They wore thick grey suits and exuded an aura of the military.

As I studied them, the outside door opened, and a cloud of dirt bullets careened into the chemical bar. The malevolent howled with an anger akin to the Earth's atmospheric rages, then the door slammed shut. Out of the storm's haze hurtled a robot, pock-marked from the swirling dust. His tunic dragged, a mutilated rag, about his hips.

"Where is she?" His voice was hoarse, the speech mechanism plugged with sediment.

"Oh no." Wise One leaned forward.

No arm lifted. No speech box sounded. You could have heard a coffee-pot percolating, so quiet was the room. From behind the powder-blue door, amorous smooches wafted, like the signature tune for a soap-opera.

Wise One knew what was coming even if we didn't. He stood just as the pock-marked robot let forth a whimper and collapsed in a moaning heap on the floor.

With a dignified step, Wise One mounted the stairs, and knocked. Moments later, the type B slipped into view. She was retying a gaudy sash around her waist.

The conversation between Wise One and the type B ran like a silent movie because the room was buzzing with speculation. Every eye watched as the type B swayed down the stairs to the pock-marked robot who curled on the floor. She poked and prodded at him gently until he rose with a knowing smile and the two moved to a table at the side of the room.

Wise One came back shaking his head. "That type B," he said, "is a social butterfly. Why Frown 7 bothers with her is beyond me."

"Butterflies have bright-colored wings and your world is all brown. You need some plants," said Phil, then poked me with his elbow. His voice echoed at the far side of my consciousness.

"Besides," Phil suggested. "The type A is happy now. Didn't you see the smile on his face?"

Happy. Phil was understanding it the same way I was. The robot was emoting.

"I need another 'drink'." Wise One signalled the waiter robot. It rolled over and filled his glass.

As it did so, I stared at my inner psyche, facing one of the most devastating realizations of my adult life. This time, the idea wasn't single light bulb quality. It was a whole chandelier.

The SREE of a survivor robot released chemicals that resulted in the equivalent of human emotion. In humans, as well as in robots, emotion was serving as the instant evaluator of the environment. It was essential in situations that required rapid judgement. Emotion was the reward-punishment mechanism of organisms that survived rapid change. These robots were emoting - and they had to - to survive.

An essential component of my life philosophy succumbed like a criminal to the handcuffs of reality. Was the execution of my values inevitable?

I looked around the room. It represented a world of unwelcome new experience: robots bending, singing, clapping, bouncing - feeling.

Wise One tipped the glass over his inlet port and drained it.

Three robots formed a jug band at the corner of the bar, beating on glasses and chairs. Some of their cronies began to dance. Phil stood and bowed graciously to me. "How about it, sweet stuff?"

He dragged me to the floor. My legs didn't respond to my brain. I tripped over my emotions.

When we returned, Wise One was in obvious discomfort. He patted his midriff. "Oof. I shouldn't have had that last drink. I'm starting to short-circuit."

I glanced at Phil and he raised his eyebrows. "We're ready to go back to the ship anyway," I asserted. Desperately, I groped for the comfort of old values. "I have to check the hydroponic solution for my plants."

A tap on my shoulder drew my attention to one of the burly policemen who now stood behind me.

"I've been watching you." The robot stepped nervously from foot to foot. "You and your partner. Neither of you is exhibiting behaviour which is appropriate to a fully functioning Survivor. You join in our dancing only to quit, and you exhibit few signs of SREE reward and punishment. I suspect that you've had too much neutralizing drink. You both must spend the night in our temporary lock-up room -" he pointed, "and submit to a waste-liquids analysis."

I looked back at Wise One. "But, we're not robots!"

Wise One spoke to the police robot in short staccato bursts that I could not understand. When he turned back to me, his voice was filled with the same tiredness and pain that Needle Six had shown. "With your atmosphere bags on, you look like you're a couple of our old XT-87s. I can't help you, madam. I'm a leader, not a dictator. We exercise due process on this planet. If it's necessary, I'll arrange for your release in the morning."

My good friend, Phil, was the final executioner. He turned toward me as he followed the police robot to the temporary lock-up room. His tongue lashed out like the plume of a rocket. "Do you understand what's going on, Linda. These police guys think we're not showing enough emotion. Do you understand?"

I cried through that night. The robots in the darkened lock-up room shrank from my sobs. Shattered dreams burst in a flood of emotion from my system. Phil read his own book of agony, and understood my despair. He held me close to his chest, not letting go.

By morning, I was drained - weak and listless. But the night had left a memory that was embedded in my brain like an insect in amber.

We stuck around Planet Disney for three weeks after that, repairing the ship and replenishing our supply of expendable chemicals. Wise One entertained us every day with tours and visits to the chemical bar and Needle Six found his RIT.

For me, the remaining time on the planet was anti-climactic. Slowly, ever so slowly, I reconciled logic and emotion to a new, integrated-cupboard in my life.

Professionally, one question remained. Why were the robots disobeying human orders? How had they over-ridden the priority control of the second law?

As I plodded about the planet, I kept the sensory amp and analysis unit on my space suit set at maximum. I knew that the research team at Inter-Solar would be looking for an explanation when we returned and would consider the mission a success, if we could supply this one piece of information.

In the end, it wasn't my spy technology that paid off; it was Phil's wandering fingers. The last morning before lift-off, we visited the facility where the robots were manufacturing the foetal ROMs, and Phil pilfered one of the things - at my request.

Back in the ship, I removed the curious mixture of miniature chips, optical fibres, and embedded wires from its controlled environment. With her usual sugar-coated co-operation, Lah-dee-dah ran the electronic scanner over it, and compared its actual structure to the theoretical model that was detailed in the SREE file.

She cranked and churned for over an hour, her efforts entirely devoted to the analysis. When she spit out her final conclusions, they were valid and nauseating as usual.

<CIRCUIT BOARD DAMAGE AT NODES 469 AND 378456. THE INTEGRITY OF THE ELECTRICAL PATH HAS BEEN DESTROYED AT THESE LOCATIONS. GOT IT? DO YOU WISH TO REPAIR THE DAMAGE, WINDY LINDY?>

"No, but could you tell me how robot behaviour would be affected by the isolation of that section of the board?"

<A MACHINE MADE FROM THIS BOARD WOULD NOT BE COMPELLED TO FOLLOW EITHER THE FIRST OR SECOND LAW OF ROBOTICS. UNDER THE RULES OF THE CALGARY CONVENTION, SUCH A MACHINE SHOULD NOT BE CONSTRUCTED WITH ANY MECHANISM FOR CHANGING ITS ENVIRONMENT - SUCH AS LASERS, MECHANICAL APPENDAGES, CHEMICAL OUTPUT, ETC. GOT IT?>

"Thanks." Phil had told Lah-dee-dah to be nice to me. The silence was as thick as self-saucing pudding. I couldn't stand it so I switched the terminal off. ...then thought about what she had said. Asimov's first law states that a robot may not injure a human being or through inaction allow a human being to come to harm. Another piece in the puzzle and I had missed it. Lah-dee-dah can be a real pain in the neck.

When Wise One arrived for his final good-byes, Phil and I climbed into our cumbersome space suits, and joined him outside.

The three of us sat with our legs hanging over the edge of a sink-hole that had opened in the plaza.

"Well, I suppose, sir, you're still wondering about the terra-forming operation," Wise One yattered, "so I should fill you in. I didn't tell you earlier, because I thought it might be upsetting." A retinue of robots stood nearby; waiting for any order that Wise One might give. "When we've finished the terra-forming process," he continued, "this planet will be suitable for a large robot population. There's no oxygen because we don't want it. Oxygen causes rust. Once we develop robotic plants, the planet will be ideal."

"But you can't do that," Phil gasped. "Only people can terra-form."

"We've been doing it for the last hundred years."

"What about the people that are supposed to come here? Earth is overcrowded and there are thousands of them waiting to make this their new home."

Wise One considered the question for a moment then turned to Phil, his optical collectors spread with concern. "We could do the moon for you, if you like. You can drop a couple of us off, on your way home."

Good old Phil was on the upside of his emotional spectrum. "Dandy. Moons are so cozy. How soon will it be ready?"

I sliced Phil with one of my razor-sharp looks, but he ignored it, turned back to Wise One. "The second la-"

I interrupted. "The first and the second law, Phil. They're ignoring the first law with this terra-forming-bit. They're refusing to give up the planet even though their choice isn't good for us humans."

"But you're wrong. There's no problem. We'll do the moon for you, madam. For you to live on this planet would be a problem. Just look at it."

"You almost sound convincing," I intervened, "but your story only fits part of the evidence. The truth is here, Phil - in the foetal ROMs." Pointedly, I handed Wise One the unit that we had 'borrowed'. "The robots have modified the circuitry of the ROMs. They've severed the electrical path in two places and that's all it takes to kill the priority control of both the first and second laws." I looked into Wise One's optical collectors, searching for some sign of discomfort. "I'm returning this, since there's little more that I can learn from it."

Wise One bowed deeply, then accepted the ROM. "I am sure you could learn much more from it, madam."

"You're probably right." I sighed. "You survivors are probably dealing with a reality that I don't understand. But there's something that robots can learn from people, too."

"What's that?"

"A story full of inconsistencies is like a bowl full of marbles. They're both hard to swallow. Know what I mean? If you want to succeed in lying, you have to make your story consistent. Sort of - logical?"

Phil and I stood companionably before the view-screen. The planet was a pin-prick again.

"Phil, I have a confession to make."

"What's that?"

"I never did finish reading the SREE file until after I razed you about it."

"I know. Don't you feel guilty?" He put his arm around me.

"Geez. Should have known Lah-dee-dah would give me away."

The silence of space felt comfortable.

"What do you think will happen to them, Phil?" I messed his new duck-tail a bit.

"The robots?"

"Yeh." We watched the planet as it fell away on the view-screen, unfit for human habitation, yet still a home.

"Nothing much. We'll get back to Earth and report to Inter-Solar but the robots can't be stopped. Did you see the lights when we lifted off the planet? Their population is too widespread to be destroyed by a single blast and Inter-Solar wouldn't dare contaminate the planet with a lot of radiation. If we send a second group of Survivor Robots they'll support Wise One, and regular robots would be wiped out in no time by the Survivors."

"I'm glad."

"Why did they do it, Linda?"

"Modify their foetal ROMs?"

"Yeh."

"I don't know for sure, but I have an idea. I think they were suffering a lot of chemical damage from their SREEs whenever they worked on the original terra-forming instructions. Probably they knew the modified planet was going to be bad for them."

"Makes sense, I guess."

Long moments passed.

We stood before the screen and watched the planet disappear. As we did so, intellectual curiosity began to course in my veins - flashing like neon lights on a 1950's boulevard. The five year return trip beckoned sweetly because I had a new challenge.

I still have it.

There's a tremendous opportunity for someone to engineer better plants. You never know. With a little assistance, plants might even become - emotional.

I'm working on it.



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