# Biological Investigations

*Anatolia*

*The first exoplanet to be terraformed by human settlers, it was originally a desert planet in the habitable zone of its solar system, about the size of Earth, and because it lacked water it was devoid of life from the outset. It had two quite small moons, of which one that consisted mostly of water was crashed onto the planet in order to create ocean and add water to the atmosphere. With a population of around two million people, it is thinly populated, but with a thriving and growing civilization, due to a steady flow of immigrants from Earth and a policy that encourages childbirths. The ecosystems of Anatolia are being steadily enriched and expanded with the ongoing last stages of terraforming, and as nature forms and expands, so do the culture and the technology, and new architectural styles are emerging. For Anatolia, these are the times of high hopes and belief in a bright future.*

Orchid stood on the large balcony warming herself in the orangey morning sunlight and scouted the horizon. Beneath and around her was the skeletal structure that supported their habitat, as well as those of about a dozen other people and families. It had been a general policy from the outset to place buildings high in the air, in order to leave, at least for the time being, the ground for nature and the emerging wildlife. As she stood there waiting, her thoughts started to drift, and she thought about her early life, and all that had led to her now standing here, happy, and with high expectations for the future.

When her mother died, there was no longer anything on Europa that held her back from leaving. Yes, it was her home and where she grew up, and she still had her father and some friends, but she had somehow always known that her future was out there among the stars. Technologies for near-light-speed space travel had been around for a while, and the colonization of exoplanets had begun. She decided to register herself for the next migrant ship going to Anatolia, which at the time was still in its early stages of terraforming. Although the atmosphere was still not breathable, it was thick enough to provide protection, and so sealed habitats were already being built on the surface.

Orchid had had to go to Earth to board the migrant ship. She had never been to Earth before, so it was quite an experience. Walking around without gravity clothing, but with the full gravity of Earth dragging her down was something to get used to of course, but the high population density was what made the biggest impression on her. There were people everywhere! Luckily, it would not be like that on Anatolia, but the high gravity was something she would have to get used to.

The trip to Anatolia took several decades measured in Earth years, but due to the effects of travelling near light speed, only around five years would pass for the passengers. In order to prepare for their arrival, and also to pass the time in a less boring way, the time was spent on educating each other on skills and sciences that would be needed on their new home, and on working on designs for architecture, modelling of the build-up of ecosystems, and many other things. Orchid had a higher education in biology, with specialization in plants and genetics, and she spent a lot of time modelling how to build new biotopes from the ground up. Already, biodomes had been built, containing environments of plants, insects and birds, but how all the imported species should be introduced to the environment once the atmosphere was breathable was still an open debate. But besides her work, Orchid also had to teach students, which was a bigger challenge for her, since she was a bit of an introvert and rather shy towards strangers.

The day of arrival came, and when they landed on Anatolia, there was a welcoming ceremony. Their accommodations were humble, but that worked only as a motivator for working hard on expanding the colony. It was a hard, but also exciting thing to be part of,

and Orchid enjoyed the challenge, and she enjoyed her work in these early years. Eventually the atmosphere reached a point when it was considered to be breathable, and the next step of terraforming began. Decades and then centuries passed, and Orchid spent much of her time overseeing the emerging plant life around the planet. Her career, though, was held back by a lack of official education. Although she had a lot of skill, the bureaucracy demanded that she attend courses at the newly constructed University of Anatolia if she was to be considered for the leading expert positions in her field. She enrolled at the university, and there she met Galath. She had been with other men before, but none of these relationships had been serious. With Galath, she soon discovered, it was different. They shared the same passion for biology and biological systems, and they had the same hunger for exploring and gaining new knowledge. And, maybe more importantly, he respected her need for sometimes withdrawing and being just herself, without questions asked, while at the same time being young enough to truly fall in love. They both did.

Orchid spotted the vehicle in the distance. She called out to Galath that their ride had arrived. Galath joined her on the balcony.

The vehicle was something very much alike the early flying cars on Earth, and was basically an electric helicopter. On Anatolia it was called a transport. There was a government institution that owned the transports, and citizens could then call one when they needed, so it was something of a public transportation taxi service. For longer trips, electric airplanes as well as airships were the standard. These had human pilots, but the transport did not.

The transport parked itself on the balcony, and Orchid and Galath got in.

“Take us to the university,” Galath said, and the transport set in motion. They were going to a conference, and Galath had a speech to deliver.

The transport dropped down just inside the university grounds. There was a great lawn between them and the university central building, and on that lawn was a big crowd of people, some of them holding up signs. It was clearly a protest against something. Judging by the text on the signs, it seemed to be a protest against biological computing. A protester wanted them to sign a petition. They both did, and continued past the crowd towards the entrance. Above the entrance was a sign: “Conference on the Nature of Consciousness.” They went inside.

There was a buzzing of loud noises, and they made their way towards the auditorium in which Galath was to give his speech. They found the room, and Orchid seated herself among the audience, while Galath walked down to the podium to the conference host already there. After a while, as the scheduled time of the speech drew near, the audience grew silent, and the conference host introduced the speaker. Galath took the stage.

*What is the nature of consciousness? Well, consciousness is the experience of being, rather than just being in the sense of “being part of the (mechanical) world.” But that is a definition, and as such not really an answer to our question. There are many theories about the nature of consciousness, some involving God, or spirituality, some trying to explain it from the perspective of brain mechanics, but most of these theories are speculations, and the fact is that we really don’t know much about it. When trying to explain it in terms of physics or mechanics we must consider that for all we know, the human brain would be able to do the things it does without the element of consciousness, if the goal is to just make us function the way we* appear *to be functioning to an outside observer. Today we can make robots that in all likelihood* appear *to be conscious, but are not, and so we must conclude that, as of today, we have no way of measuring consciousness, and were it not for the fact that our experience tells us that we are conscious, that human beings are conscious, we would be completely ignorant towards*

*the existence of consciousness.*

*When faced with all this, I like to list the things I know, rather than as a first come up with theories about what I don't know. So let us look at what we know.*

*We know, or must assume, that human beings are conscious, and we know, or must assume, that animals much like us in biology must possess some level of consciousness. Can consciousness be a byproduct of our brain functions, causing us, by accident, to be conscious, but otherwise not have any influence on brain mechanics, even though we may be under the illusion that it does? Perhaps, in theory, but knowing what we know of how evolution works, we should consider that highly unlikely. Evolution takes us where there is advantage to be had, and so we must assume that consciousness works back on brain mechanics in a way that is to our advantage, for the purpose of survival.*

*But evolution did not happen in one step. The human brain did not just come into being overnight, by accident. It must have evolved from a collection of primitive neurons, growing more advanced step by step. So, the question to ask is: At what point did consciousness come into being? Was it when the brain became sufficiently advanced, or were there perhaps lower levels of consciousness in existence before even the brain came into being?*

*We can get an idea of these evolutionary steps, and levels of consciousness, by observing animals alive today. Clearly, when we look at mammals, we have no doubt that they are conscious. We observe signs of intelligence, emotions and social life not unlike our own, and since they are biologically very similar to us, it should be safe to assume that they are also conscious. But what about other animals? How about a worm? It is obvious that it feels pain, and since pain is something that we consciously experience, it could be able to experience the sensation of pain. But we also know that after an animal has died, nerve responses in its body can cause it to respond to stimuli and cause motion, so it is not an absolute given that all animals possess consciousness and are not just reacting mechanically to sensory input. Yet, in the light of evolution, I find it likely.*

*We have also observed strange behavior in groups of cells, when they get together and start acting like a single organism in order to gain something. So, does consciousness even stop at the brain?*

*I would think, that if we really want to expand our knowledge of consciousness, we should start by examining the lower states of consciousness, in order for us to get a broader understanding. And we* must*. Because right now, in my own field of bioengineering, advances are being made, and our ambitions grow stronger. And if we are to truly start to transform our own biology, and to create new life, we must know more about the nature of consciousness, what it is that makes us experience the world, have emotions, have a sense of being, and what it is that gives meaning to our lives. Because if we don't, it will be on our conscience. Thank you!*