

A Star So Close, Yet So Far Away

A Contemporary Report on the Lux Mission to Proxima Centauri

January 1, 2100

The closest star system to Earth is Alpha Centauri, only 4.3 light years away. Its system is actually composed of the binary pair Alpha Centauri A and B, sunlike stars, along with a distantly-bound companion Alpha Centauri C, named Proxima because it is the nearest star to Earth in its system, making it ideal to study. The true object of interest is Proxima's planet, Proxima b, which is thought to be able to sustain life; therefore, the Lux mission was created. On the research ship Sidera is a team of four astronauts kept in stasis: Dr. Michael, an archaeologist, Dr. Sheridan, an engineer, Dr. Fraiser, an astrobiologist, and myself, Dr. Rosener, an astrophysicist. We are accompanied by the AI Chiron who will manage the ship's systems and scientific research while we are in stasis. Our goal is to evaluate the possibility of life on Proxima b. I am writing this report for the general public about the science of the Lux mission, as the mission's existence will not be released until the world governments are able to determine the result of the mission; this exploration has potential for mass hysteria on both our planet and whatever we may find. All the world knows is that we are sending an exploratory probe to Proxima b, not the fact that it is manned, nor even that the crew plans to step foot on its surface. Besides automatic transmissions, Earth does not expect to receive a full report of our success for fifty years. Proxima Centauri is 4.3 light years away, and with our best equipment we can only travel at 10% the speed of light, making our journey about 43 years; then the time for our signals to travel back to Earth still adds about 4 years. Most of those years, except the first and last 2 years, we will be kept in newly-developed stasis pods to preserve our strength and sanity. No

matter the success of our mission, we might not have enough fuel to return home, but all of us are committed to put the mission before our own lives.

Where we're going, the Alpha Centauri system, is made up of stars remarkably similar to our own, which will be a good opportunity for studying the properties of our sun. Alpha Centauri A is a yellow G-type star, like our sun, that has 10% more mass and a 20% larger radius than it. It is the largest and brightest star in the system, having a surface temperature of 5790 degrees Kelvin, nearly identical to Sol's, but still has a luminosity 1.5 times greater. Alpha Centauri B, in contrast, is an orange K-type star, smaller than Alpha Centauri A, and less bright. Its mass is 0.9 solar masses, and has a radius of about 85% of our sun's. It is also dimmer, with a temperature of 5260 degrees Kelvin, and a luminosity of only half of the sun. These two stars orbit around each other in almost exactly 80 days, with closest approach in their elliptical orbit as 11 AU, or eleven times the distance between the Earth and sun, making them very far apart in general. More about the formation of these stars is hoped to be studied by Chiron, to gain insight about the formation of our own sun given their similarity and proximity. However, a quarter of a light year away from them lies our target Proxima Centauri, so distant from α Centauri A and B it was not initially thought to be gravitationally bound to them. It is a M-type star, a red dwarf, known as the most numerous stars in the universe, formed from burned out main-sequence stars. These are red in color, and much smaller and cooler than younger stars, making them difficult to see from Earth. Due to their small size, they have convection currents throughout their entire volume, allowing red dwarfs to fuse hydrogen for a much longer time, and live longer. Indeed, Proxima has a mass only 12% of the sun, and 14% of its radius. With a temperature of 3050 Kelvin, it only emits 0.15% of the light the sun does. Yet red dwarfs like Proxima are volatile, releasing large flares of high-energy radiation as a result of their active magnetic fields. Even though Proxima has weaker stellar wind than α Centauri A and loses mass slower than anything near it, this is seen as a threat to life as we know it, with that much ionizing radiation being destructive

to genetic material, an atmosphere, and liquid water, but there is regardless a strong possibility of life surviving on Proxima b.

Proxima b seems rather Earth-like at first glance, with only 1.3 times its mass. However, its eleven day orbital period, the presence of extreme radiation, and the influence of two larger stars disrupts this idea. Yet, even though life may exist not in a water-based form, we thought it impossible that any life could exist with a dwarf's frequent flares and low energy output. However, in October of 2049, we starting receiving radio signals traveling outward from Proxima Centauri not consistent with any previously observed pattern, during a period of low magnetic activity. Finally, after a year, astrobiologists and statisticians alike concluded that these irregular signals must be from Proxima b, very possibly even from intelligent life. A frenzy of research began on the exoplanet, and there were many positive signs that life could exist: Proxima b's rocky surface, the presence of water vapor, and even a small atmosphere of hydrogen and helium. Our tentative conclusion is that these life forms must have a high resistance to radiation, and are likely to burrow underground to protect against bad flares. We also expect that Proxima b is relatively unaffected by Centauri A and B, but it is possible that their gravitational interactions could shift its orbit. Therefore, from decades of bleeding-edge research the Lux mission was commissioned by the world's space agencies, all resolved to keep it a secret for the safety of Earth, out of fear of whatever civilization may live in the Alpha Centauri system.

This report will be released when the governments of Earth deliberate on the safety of the mission results. Whenever that may be, it will also be with a companion report of what was really found on Proxima b. Until then, the launch of Lux is today, on the morning of January 1, 2100. Farewell to all that I have ever known.

An Updated Report on the Lux Mission to Proxima Centauri

January 29, 2152

The truth is even more amazing than we ever could have imagined. There is life on Proxima b. There is *intelligent* life on Proxima b. The natives of this planet call themselves Ruberi, from their name for Proxima b, Ruber. Thanks to the help of Dr. Michael, we were able to open a line of communication with the Ruberi, and convey that we come in peace. Although they were amazed to see us, and happy to welcome us, they also were worried about the citizens of their planet discovering us too soon. It seems there are some problems that are universal! With both of our people's cooperation, we learned much about the Alpha Centauri system and their own civilization, and exchange we revealed information about the Sol system and Earth. However, I could see that both of us were very hesitant to tell anything that could compromise security, so we still proceeded with caution.

As predicted, the Ruberi seem to have a strong resistance to a wide range of electromagnetic radiation and they can also see from near infrared up to far ultraviolet, as a result of the varied sorts of light Proxima emits regularly. They are not invincible though, and have developed a response to hide in deep bunkers during periods of high magnetic activity, which causes more frequent and intense flares. They apparently evolved an ability to sense the magnetic field of their planet and sun, and were able to survive from taking shelter in ancient underground ruins. It seems many civilizations came before them, and if not for their own scientific progress, the Ruberi would have been extinct long ago. The atmosphere here is composed of mostly hydrogen and helium, but contains some oxygen from an unknown source. We should be able to breath without our own atmospheric systems, but are keeping them on for caution. Alpha Centauri A and B, though very distant, do affect the planet's seasons because of how much dimmer Proxima is compared to them. Though it is tidally locked with Proxima, Proxima b experiences more even heat distribution because of A and B's light, although their stronger stellar winds are gradually corroding the atmosphere on the far side of the planet. Of course though, this is not the greatest effect on the Proxima system: the gravitational pull of α Centauri A and B

bring Proxima closer to the two at an accelerating rate. This is creating a disastrous three-body problem for the Ruberi, which can destroy their orbit around Proxima, by bringing the planet closer to A and B, and plunging their orbit into perpetual uncertainty. This is also exposing them to radiation they cannot defend against, destroying their way of survival on Proxima b.

Everything we told them about Earth is obvious to anyone living there: about Sol, our eight planets, the great oceans and variety of landscapes on our planet, our many countries, etc. They were fascinated to know about how we have so much water, or why are not yet one country, or why we came... Even with our many differences, we feel united with the Ruberi by our similarities. When we look up at their great red sun, all we see is our yellow sun; each of us lives under a star with potential for giving life or death. The radio signals which first alerted us to their presence were their attempts to contact life near Alpha Proxima A and B, to see if anyone could prevent the impending disasters, just as we had done in our curiosity to detect life. With or without the support of Earth, everyone on this team has pledged to help the Ruberi and their dying world as best as we can. There is nothing we can do with our current technology, but perhaps in the future Earthlings and Ruberi together can solve these problems. I believe they show nothing but goodwill towards us, as they have even offered to attempt making more fuel for our return home; it is only right that we show the same. It is still so strange how such a feeling of friendship can exist between two worlds which have never really met. As absolutely wonderful as this trip to Proxima b has been, we still look forward to returning to our own star, so close yet so far away.

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