SAMPLE

Worlds Beyond Earth: Proxima Centauri b

Our Nearest Exoplanet

Aira Astralis

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This free sample contains the Introduction and Chapter 1. The complete book contains the full contents above.

Introduction

Proxima Centauri b is the nearest star's own nearest planet, a world orbiting a dim red dwarf four light-years away, discovered by the wobble it drags out of its star, and famous for being the address most often named when anyone asks where humanity's first interstellar probe should go. Its fame rests on proximity: the closest known planet circling the closest known star. That single fact makes it the best-studied world we cannot see.

This volume tells that world's account in plain installments: how the wobble was found and argued over, what the planet's size and year are believed to be, why a habitable-zone address near a flaring star is a mixed blessing, what the atmosphere's fate may have been, how the planet's discovery reshaped the exoplanet census, and what a first visit might look like. Each claim carries its era. Each model carries its hedge. The open files stay open.

A calibration note before the story starts. The measured shelf holds radial velocities, light curves, and flare timings. The inferred shelf holds the mass, the orbit, the irradiation, and the water history. The projected shelf holds the probes, the telescopes, and the settlements. Three shelves, three confidences, one book: keep them apart on every page, and the account stays honest.

The shelves earn one worked example before the chapters take them over. The eleven-day year belongs on the measured shelf, pulled straight from the wobble's rhythm. The mass belongs on the inferred shelf, a minimum dressed in statistics. The sail fleet belongs on the projected shelf, a plan wearing a budget. A reader who can sort any future headline into one of those three piles has already learned this introduction's whole lesson, and the chapters ahead will keep teaching it by example rather than by rule.

The example method gets its own proof of work here, so the introduction pays for itself early. Watch the shelves operate once: the flare record is measured, archived in plain telescope logs anyone can request; the planet's atmosphere is inferred-shaped, a hole surrounded by arguments; the sail fleet is projected, a drawing with funding. Three sentences, three shelves, three different futures: one cannot be unmeasured, one can be settled next decade, one may never fly at all. Every chapter runs this same sort, and by the final page the reader will perform it reflexively, which is the whole curriculum.

The curriculum takes a closing welcome, offered once and then left alone. The reader who finishes this book will notice the sort becoming reflex: flare counts read as facts, habitability read as hypothesis, sail fleets read as schedules. The change is not cynicism; it is precision, and precision is the only upgrade the popular genre ever really needs. The account ends its introduction by

promising the upgrade plainly: everything that follows can be sorted, everything sorted can be checked, and the checking is the reader's own to keep.

The keeping receives one last practical tip, and the introduction honors its promise to stay short. The tip: the three shelves work on any science headline, not just this planet's, and the reader can test them on tomorrow's news the way they were tested throughout these chapters. A discovery with a machine named, a paper cited, and a hedge priced earns its tense; anything else borrows one. The account ends its calibration here, with the reader holding a working instrument, and the chapters ahead supply nothing but practice.

Chapter 01: A Star Next Door

The planet's story must begin with its star, and this chapter is the backdrop: the nearest system's discovery, the red dwarf's temperament, and the census of the solar neighborhood, the backdrop being the stage on which the wobble was later noticed.

The star's discovery opens the backdrop. Proxima was found by telescope in the early twentieth century, named for being almost nearest, and confirmed as the Sun's closest stellar neighbor after a century of parallax work.

The parallax work merits a sentence of respect here, because the neighbor's title was earned by patient geometry. Astronomers measured the star's tiny annual shift against the background field, triangulating the distance with instruments that had no business succeeding as well as they did. The result was a milestone of nineteenth- and twentieth-century science: the distance scale to the nearest stars, anchored in plain triangle arithmetic. That old geometry is why the planet's distance, four light-years and change, can be quoted in this book with no error bar worth printing.

The absence of an error bar warrants a closing tribute, because it marks the account's one luxury. Every other number in this book will carry its uncertainty like a traveler's pack, but the distance stands alone, settled by geometry so old it is taught to teenagers. The nearest planet's four light-years is therefore the account's anchor leg: the fixed stake from which every wobbling estimate is measured. When later chapters hedge, the reader should remember that the hedging happens against this one unhedged fact, and that the stargazers of a century ago paid for the certainty in advance.

The advance draws one anniversary note, because the account likes its debts dated. The parallax campaigns that fixed this distance ran before the planet was even suspected, funded as basic sky cartography with no application in sight. A century later, the settled four light-years is the foundation of every probe study, every telescope schedule, and every headline's arithmetic. The chain from patient geometry to interstellar engineering is the campaign's favorite causal line in any book, and the nearest planet is its cleanest exhibit: nothing about this world would be schedulable if the star's distance had been left fuzzy. It is a red dwarf, small, cool, and faint, invisible to the naked eye despite its address. Its companions, the two bright components of the Alpha Centauri pair, orbit far away from it in a lazy century-plus circuit. The neighborhood's geography matters here: the three stars form a loose triple system, and the nearest single star happens to be the smallest and dimmest of them.

The red dwarf's temperament fills the middle of the backdrop. Proxima is a flare star: its surface erupts without warning, brightening by large factors for minutes at a time. The flares matter more than any other single fact in this book, because a planet huddled close to such a star is bathed in its tantrums. The star's habitable zone lies so near the star that a planet there sits inside the flare weather, an arrangement the Sun's planets never endure. Every later chapter on habitability inherits this problem from the star's own character.

The inheritance needs a scale note so the problem lands with its full weight. The planet receives flare-driven ultraviolet and X-ray doses far above anything Earth's surface has endured, because the same star that powers photosynthesis candidates on paper also throws the worst space weather in the neighborhood. A planet with a deep ocean or a thick atmosphere can absorb the punishment for a while; a bare rock takes it on the chin. Which of those two the nearest planet is remains this book's central unanswered question, and the star's character is why the answer is hard to get.

The hardness needs its consequences spelled out, because the difficulty shapes the whole book's pace. The atmosphere question cannot be settled by looking harder; it must wait for mirrors not yet finished. The water question cannot be settled by cleverness; it must wait for the same mirrors. The account's patience is therefore not a style choice but a physics consequence: the star's tantrums muddle every cheap method, and the expensive methods are still being built. The reader who understands this will forgive the later chapters their patient negatives, which are the sound of the field refusing to guess.

The refusal invites a hearing, because it has a tone the coverage rarely plays. Listen to the actual papers on this planet and the sound is deliberate hedging: perhaps, may, consistent with, under the assumption that. None of this is weakness; it is the discipline that survived the false-alarm era, spoken aloud. The account has reproduced that tone throughout, and the reader who found it slow should reread it as a feature: every hedge in this book is the scar tissue of a retracted claim somewhere in the field's past, and the scars are what make the remaining confidence worth having.

The scars earn their provenance visible, because the account's hedging should not read as mood. Each hedge in this book traces to a specific event: the retracted next-door claims that shaped the cross-examination, the dissolved dust signal that shaped the stakeout's patience, the false-alarm era that shaped the discovery's statistics. The reader who wants the receipts can find them in the field's own retraction notices and follow-up papers, all public, all archived. The account keeps its tone's receipts on file, in the campaign's

standing style, and closes this note with the ledger balanced.

The census closes the backdrop. Red dwarfs like Proxima dominate the galaxy's stellar population: most stars are small, cool, and long-lived. That means the nearest planet around the nearest star is not a cosmic accident but a typical sample of what the galaxy holds in bulk. Whatever we learn about Proxima b applies, with care, to billions of systems like it. The nearest case is therefore also the most representative case, a double gift the account will cash in repeatedly.

The cashing gets a forecast here, offered as method rather than as promise. Whatever the giant telescopes find at Proxima b, an atmosphere or a bare rock, the finding will be applied immediately to every red-dwarf planet in the catalog, because the nearest case is the only one where the follow-up instruments can be pointed first. The account will therefore quote this one world again and again, not from favoritism but from logistics: in the red-dwarf universe, the nearest planet is the bank where the first deposits are made.

The deposits take a forecast of their order, because the account can promise the schedule of the questions if not the answers. First will come the atmosphere's verdict, the mirrors' opening business. Second, if the verdict is air, the hunt for its recipe, water vapor and carbon dioxide and whatever else the fingerprints show. Third, only after the first two clear, the talk of probes earns its urgency. The account stages its chapters in exactly this order, so the reader will receive the deposits as the field plans to make them, rather than as the headlines prefer to spend them.

The red dwarf's own clock is the census's quietest astonishment: stars this small burn their fuel so slowly that their lifetimes run to trillions of years, longer than the present age of the universe, longer than the galaxies around them. The Sun will swell and die within ten billion years of its birth; Proxima will still be shining, barely changed, when a thousand generations of Sun-like stars have come and gone. The reader should hold the number's consequence for the planet's file: the world's star will outlast every question in this book, and the planet, if it keeps any air at all, has more time ahead of it than the universe has so far given anyone. The census line held plainly: the galaxy's most common stars are also its most patient.

The deposits receive their denomination named, because the account has been paying in a specific currency. The currency is the scheduled question: what the atmosphere holds, what the water did, what the surface weighs. Each question is bankable precisely because its instruments are named, funded, and under construction, and the account has refused to bank anything vaguer. The reader should leave the chapter holding a portfolio of five or six dated

questions, no answers, and the standing instruction to collect as the decade pays out.

End of free sample. The full book is available at putrabooks.github.io

ABOUT THE AUTHOR

Aira Astralis is a science writer specializing in astronomy and space exploration. Her work spans the full breadth of humanity's relationship with the cosmos -- from the earliest naked-eye observations to the engineering marvels of modern space missions.

Her books are built on a foundation of primary sources: peer-reviewed research, mission archives, and direct engagement with the scientific community. She writes for readers who want to understand not just what we know about the universe, but how we came to know it.

She believes that the most important frontier is not out there but in the gap between what scientists discover and what the public understands. Her books exist to close that gap.