



ISSUE 2 | 2021

WORLDBUILDING MAGAZINE

COSMOLOGY
& other topics

Planetbuilding

The Bewildering Variety of Planets

Divining the Heavens

Creating Celestial Beings and Bodies

All the Things That Trees Can Be

From Yggdrasil to the Bark of a Willow Tree

Analysis | Art | Interviews

A Community Project

Prompts | Stories | Theory

LETTER FROM THE EDITOR

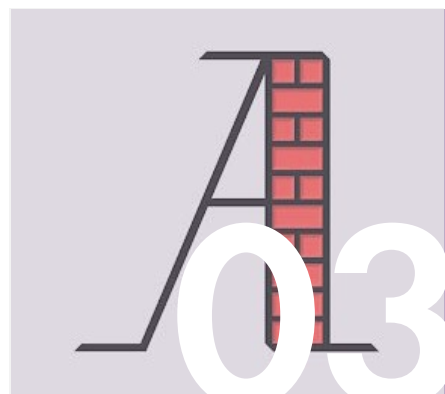
When the topic was officially selected for this issue of Worldbuilding Magazine, we were incredibly excited that Cosmology had won! Then we asked, “What even is cosmology?” An interesting topic full of possibilities, certainly, but it occurred to us that there are many potential interpretations, appropriately so given the vast nature to which it refers.

Cosmology can be the bodies that make up your extraterrestrial universe: planets, stars, and galaxies. It can also be the way a specific people’s mythology structures their understanding of the cosmos. Do the realms hang upon the boughs of a world tree? Does our world dwell upon the back of some grand cosmic creature? Does your people’s world revolve around their star, or does it revolve around them?

We have been seeking our own answers to these questions since the dawn of humanity. Where do we sit in the world beyond what we see? Does it matter if what we believe about it is truth? Are we alone in this immense expanse of space? I’m certain that this issue will not contain the answers to these questions, but we will provide you the tools to craft your own answers in the world you build!

I’m grateful to this incredible team of writers, editors, and artists who have given their valuable time to this cosmic endeavor, and for trusting me enough to guide us through it. I hope you enjoy this issue of Worldbuilding Magazine. As the great Buzz Lightyear would say, “We’re not on my planet, are we?” (Bet you thought I was going to say the other one.)

T.F. Weiland, Editor-in-Chief



EXCLUSIVE INTERVIEW
with **EDGAR GRUNEWALD**
a.k.a. **ARTIFEXIAN**



COSMIC SCRAMBLED EGGS



ALL THE THINGS THAT TREES CAN BE

CONTENTS

3 Exclusive Interview
Edgar Grunewald
a.k.a. Artifexian

9 Leaning Into the Mystery

15 Cosmic Scrambled Eggs

18 All the Things That Trees Can Be

24 Planetbuilding

31 Hero’s Journey Contest Winners

37 The Barrow Sentinel

40 Divining the Heavens

ADDITIONAL CONTENT

44 Ask Us Anything

49 Contributors

EXCLUSIVE INTERVIEW WITH EDGAR GRUNEWALD

Interviewed by Adam Bassett

 INTERVIEW

Edgar Grunewald began his YouTube channel *Artefexian* in 2014 with the aim of creating a resource for worldbuilders based on real science, history, mathematics, and other forms of research. We got a chance to talk with him and ask about how he got into worldbuilding, his advice for creating cosmologies, and a bit about the world he's creating during his livestreams!

My name is Edgar Grunewald. I run a YouTube channel (and podcast) called *Artefexian*. My goal with it is to teach people how to worldbuild and create their own constructed languages (conlangs) in a believable, scientifically informed way. So that's everything from constructing stars and galaxies, down to plotting rivers, etc.

Thanks for joining us, Edgar! First, can we go over how you got into worldbuilding—and all the science/language/etc. studies that go along with it for you?

Well, my first dabblings with worldbuilding were as a very young child. My family went to a Pizza Hut this one time, and the meal I ordered came with a foldable paper pirate ship and pirate characters. I absolutely fell in love with them. For the next several months, I came up with increasingly elaborate adventures for the characters.

I then got into music (I am a classical music major), so worldbuilding took a back seat for many years. Then when I was in my mid-late teens, I came across a book called *World-building: A Writer's Guide To Constructing Star Systems and Life Supporting Planets* by Stephen L. Gillett—which re-sparked my interest in the topic.

What really got me hooked was that the author used science to create fantastical worlds. Something I didn't realize one could do. So instead of simply saying "my planet has two stars," I could now work out their masses, their periods, what effects they would have on the planet, etc., and this just made the whole creation process much more real. Like, I just came up with this bizarre setting...and guess what...the math checks out! It could quite literally exist out there in the cosmos.

There are two reasons why I focus so heavily on the science side of worldbuilding and conlanging. Firstly, it's what I enjoy. Secondly, I figured out quite early on that I'm a pretty awful writer, both in terms of novels and TTRPGs, but I still wanted to engage in this sphere of creativity. I figured that I, and my work, could act as science advice for those of us that can write competently, if that makes sense.

So do you view Artefexian as a kind of service for people—while it also allows you to explore some of your interests?

I hope so. I worked as a music teacher for almost a decade, so teaching really is a part of who I am. I love it. I love seeing people taking something I talked about and then crafting a full setting from it.

"I FIGURED THAT I, AND MY WORK, COULD ACT AS SCIENCE ADVICE FOR THOSE OF US THAT CAN WRITE COMPETENTLY."

Additionally, *Artefexian* also acted as a means to compel me to further my knowledge. Pre-*Artefexian*, I had a habit of getting horribly bogged down in worldbuilding minutiae. I remember spending an entire semester in college thinking only about stars, and literally nothing else as far as worldbuilding was concerned.

This was not very fulfilling, so I decided to make videos from the stuff I discovered, figuring that if people watched my videos, I'd be forced to move onto the next topic. If I hadn't enjoyed spending months on stars, others definitely wouldn't...and I'd hear about it in the comments. And so far it seems to be working.

This whole thing started with stars, it sounds like, which is convenient given this issue's title. If you don't mind, I'd like to explore the topic of cosmology with you. What are a few things that you might encourage people to consider when they look at their world's skies?

I'm a top-down sort of worldbuilder (cosmology > culture). So it started off with universes, galaxies, stars, etc.

I'd encourage people to build scientifically, and then ask how your creation might be interpreted by pre-scientific societies. Like, use math to work out the exact physics of a Tatooine-style binary star system, and then view it from the perspective of a native of the world. Maybe the stellar eclipses are the stars devouring and then vomiting each other up. Maybe this event gives rise to reincarnation narratives in the culture, etc.

In terms of starting off, I usually dissuade people from doing anything too adventurous. Oftentimes, people want to have a ton of moons and a ring system and so on. I think it's more appropriate to take an Earth-like set-up and tweak it very slightly, and then ask how this slight tweak affects how my inhabitants view their world.

I used to say that worldbuilders don't care enough about science, but I feel that's becoming increasingly untrue. For example, I just finished reading N.K. Jemisin's *The Fifth Season* in which plate tectonics, of all things, play a central role in the narrative. Everything she says about plate tectonics (outside of magic) is legit—which I think is awesome. Amazing book, too!

Where do you think people are spending too much of their time, and where do you think they spend too little? To ask this another way—what aspects of worldbuilding do you think are over-appreciated and which are underappreciated? Additionally, what advice do you have for somebody who feels the need to keep tweaking one aspect or finds it hard to move on to new topics on their project?

If we're talking strictly in terms of physical worldbuilding. Like, literally the crafting of the physical form of a world, I think people tend to be too fascinated by the weird stuff: multiple

star systems, planets orbiting stars in weird figure-eight movements, black holes, rogue planets, habitable moons on really weird orbits, atmospheres laced with epic levels of neon, etc. Much like the answer to the last question, Earth is already weird, and tweaking it very slightly is often enough to produce radically alien worlds. This is not to say that the really weird stuff isn't valid or fun, just to encourage people not to overlook the more 'normal' things. Do you really need three moons, when one moon plus a whole bunch of associated mythology and cultural building would work really well?

Follow-up answer: public accountability! Share your work with friends, start a YouTube channel or blog. People will encourage you to move along. Also, keep the adage "don't let perfect be the enemy of good enough" in mind at all times.

Why don't we switch things up here and talk about your livestreams for a bit, where you are creating a world (not just showing a tutorial on how to create one like you do on YouTube)?

Cool! So at the moment, I run these patron-only livestreams in which I am working on a small interstellar empire and creating a language that will act as a sort of lingua franca in the setting.

Once I have all the physical, sciency stuff worked out, I'm excited about using the setting to say something about the Irish experience (I'm Irish). The Irish experience is one shaped by, among other factors, emigration and colonization.

I'm excited about setting a hegemony interstellar empire and exploring how it might crumble and potentially collapse and what that means for the identity of its various inhabitants. That's a long-term thing, though. In the short-term, I'm excited about completing my catalog of worlds and getting that conlang up and running.

How involved is this custom language in your setting?

It'll be interesting to see how the various colonized people treat it. That lingua franca will be the language of the colonizers. Perhaps some colonized people will view it positively. They may see it as the "advanced" culture uses this language, and now they are a part of that advanced culture. Whereas others might see it for what it is...linguistic imperialism. The colonizer's language is wiping out native tongues all over the place.

In many ways, the language and the world will (hopefully) explore the same themes: colonization, imperialism, emigration, and so on.

Interesting. I know you have a knack for languages. Is there anything specific that inspired this one or that you're enjoying playing around with for it?



I lived in South Korea, so I was inspired to create something East Asian-like, at least in its surface aesthetic. Under the hood, it hopefully will have small traces of Irish running through it.

That's awesome. Speaking of the Irish component, how do you intend to bring that in? What about the "Irish experience" are you looking to explore in this new setting?

What emigration/colonization does to national identity, and how that plays out post-colonization. Not to get political here, but a lot of the problems here in Ireland can be traced pretty directly back to the effects of colonization. It's my hope that I can tell, through the world and its language(s), an allegorical tale of Irish-ness. Not that I'll ever write a novel or anything. Again, I am an awful writer. But I'd like it to exist in my mind and the minds of those watching the streams. And as with a lot of projects, it may well end in a dead end, but the above is the plan at least.

Yeah, I don't think it's required to worldbuild for the sake of writing a novel or anything like that. You also do it just to explore ideas like this. Even without a novel, stories can still exist in the world's history and such. It sounds like a really cool project!

For sure. Worldbuilding as a pure hobby and intellectual pursuit is totally valid. Worldbuilding for worldbuilding's sake is okay.

Now, a lot of the stuff you talk about on Artifexian is about the science of things—how to design accurate star systems and landmasses and so on—is any of that directly impacting this take on post-colonization? Could you give us any examples?

Not directly. But I'll try to use the astronomy stuff to further the allegory. Take the eclipsing binary stars from before. Imagine that one is larger than the other, you can easily see a folk

narrative arising out of the phenomenon. The larger star represents the oppressors, the small the oppressed. Try as it might, the larger star can never succeed in ‘swallowing’ the small star. It also rises up, reemerges, etc.

Also, the distribution of the star systems in the empire will inform how colonization developed. Those worlds closest to the colonizer may get colonized first. So if they’ve been colonized way before the last system falls, their attitudes toward their colonial overlords may be radically different from those of people inhabiting the outer regions of the empire.

Normally I like to ask what inspirations people have, but we’ve kind of already covered some of yours. Are there any others, or do you have some recommended reading/viewing for people?

N.K Jemisin! For sure. She is a worldbuilder of the highest order. In the YouTube space, may I recommend some of my peers. To name but two, [Biblairdion](#) (conlanging and alt biology) and [Worldbuilding Notes](#) (worldbuilding with a big emphasis on culture).

I suppose I’ll add that there is no right or wrong way to worldbuild. Do what makes you happy and what furthers your goals in your projects. Just because I enjoy hard worldbuilding doesn’t mean that hard worldbuilding is correct or even better than soft worldbuilding. Worldbuilding is

an art form, and as in all art, there is no “right” way of doing things.

That said, if you are into hard worldbuilding and need a little help along the way, hopefully my work might be of some service to you.

This interview was edited for *Worldbuilding Magazine*.

Thank you to Edgar for joining us! Check out his YouTube channel [Artifexian](#), and if you’re interested in his livestreams, check out his [Patreon page](#). You can also follow [Artifexian](#) on [Twitter](#).

 [BACK TO INDEX](#)

LEANING INTO THE MYSTERY

by Ryan Gethin Williams, illustrations by Ghranze

 COSMOLOGY

Truth is overrated. At least, it’s usually not as interesting as the mystery that comes before the truth.

You want to build a universe, or perhaps you already are. And for many of us, that includes creating an alternate cosmology. After all, what is grander than creating a whole world, full of variant physics, magic, and the origins of everything we see?

There are a plethora of worlds built with wonderful cosmology. For example, Tolkien’s *Ainulindalë* describes how angels created the material world and its inhabitants with a divine song, made discordant by the Middle-earth analog of Lucifer. Meanwhile, C.S. Lewis’s world of Narnia was created by Aslan, and the stars in Narnia’s sky are his sentient followers. Cosmology offers an amazing opportunity for worldbuilders to create a world that is truly their own.

Despite this issue being about cosmology, however, I’d like to take a look at why the best move is often not to explain your universe in full. Why mystery and disagreements are such an important part of worldbuilding and often offer much more interesting story options. And, why keeping exposition on a leash can be better for you, your audience, and your world.

Let’s start with an example of how overexplaining can backfire.

THE FORCE

In Star Wars, there are sentient robots, planet-busting space stations, and faster-than-light travel. Mixed in with all this advanced technology is the Force. This unexplainable power that surrounds all living beings which, when wielded by a trained Force-user, provides amazing abilities. Telekinesis, prescience, universal connectedness with other living souls—the list goes on. The mystery of the Force is what made

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it interesting. It's an unexplainable power that few can harness, and that even the masters only understand with vague descriptions.

Then, *Star Wars: Episode 1* is released, and with it comes an explanation of the Force that nobody really asked for. As it turns out, it's simply to do with bacteria in your blood. And measuring that blood with a simple device tells you all you need to know about someone's attunement to the Force. An ancient prophecy of a Chosen One, who was supposed to bring balance to the Force, can be solved with the quick beep-boop of a handheld machine.

The audience response to midi-chlorians has been well-documented by now, but the point is that choosing exposition over mystery seemed to spoil the series for many long-time fans. The inner workings of the Force weren't important details kept away from a frustrated audience. It was as mysterious to the characters as it was to those watching the films. And everyone loved it—until it was over-explained.

CULTURAL EXPOSITION

Uncertainty creates stories, stories help to form cultures, and culture is one of the most vital aspects of worldbuilding. This is why not having a true answer for cosmological questions—either for the characters or the audience—is often the more interesting route to take.

There's a great deal of inspiration to take from the real world to help going down this route. Many cultures have a story of a "great flood,"

such as the Genesis story of God restarting humanity with Noah and his family's ark, or the Gun-Yu legend in Chinese mythology during which the emperor's cousin attempts to stop the flood with a magical, ever-expanding soil stolen from the Supreme Deity. The great flood is present in many cultures, all with different interpretations of the greater meaning behind it, and thus a different influence on culture.

Let's put this into practice. Imagine a night's sky, similar to our own, but with one key difference. There is a second moon that has been

split roughly into two halves. How would the various people of this world explain this phenomenon?

The cliff-dwelling bird-folk, who regard the family as the most important thing in life, see it not as a moon, but the egg that hatched the earth. The beginning of all life in their world, laid by the Sky Mother. And, next to the empty shell, remains

an unhatched moon, ready to spill its celestial secrets at the right moment.

Many miles away, belligerent tribes of orcs fight to seal their place in an afterlife. The greater the deeds performed in life, the higher the seat given in the afterlife. And the greatest deed of all was committed by their shared ancestor, who journeyed skywards to split the moon in twain as a permanent reminder of his prowess.

Up in the mountains lives a well-protected society of tiny, intelligent people. Their lives sustained by trading the jewels of the mountain, they turn to science and philosophy to find answers to greater questions. Perhaps the moon

has not been broken at all, but rather is slowly coming together to form a single celestial body. The question then becomes, "*What becomes of us when the halves are made whole?*"

Each night, these people look to the sky and see the same skyscape. But, the light of this broken moon takes on different meanings in their minds. It's a reminder of the importance of family for some, a nightly call to valor for others, and a prophecy of the impending end-times for the rest.

But, perhaps we take a different route. In the murky, dangerous swamps lives a group of lizard-people. Honorable and unempathetic, they are polar opposite to the carefree and loving bird-folk. The few meetings that have taken place between these people have rarely ended without blood being spilled. However, lock a rogue adventurer from each tribe in a cell together, and let them speak. Shockingly, the tale of the egg that hatched the world is familiar to them both. They even have the same idea of what rests in the unhatched moon. And, as they speak through the night, they find that their stories are almost identical, and even that their values are more closely aligned than they originally believed. This connection may be enough for the two to trust each other a little—at least enough to work together on a jailbreak.

So, take this as an exercise. Create some unexplained sites or events that fit into the aesthetics of your world. A valley with a bottomless chasm, a star that moves differently from the others, the aurora borealis, an eclipse. Then, try to come up with ways the different peoples of your world would explain them.

AUDIENCE EMPATHY

The presence of objective truth also impacts your audience and the way they see the people of your world. Let's invent some cultures and see

how they're influenced by their interpretation of cosmology. We'll call them the Glutto and the Creedi peoples.

First off, we have the Glutto people, who believe that everything in the universe comes from nothing and will return to nothing. There is no objective truth in morality, no afterlife, and no greater being overseeing their actions. These people may be nihilistic, impulsive, decadent, and hedonistic. If nothing means anything, then pleasure and self-servitude are the only things that matter, more or less.

On the other side, the people of the Creedi believe in a heaven and will try to stick to their religion's moral code. Being denied access into Heaven would be a common fear across members of the group, though they would vary greatly in their adherence to the burgeoning faith.

Having no clear answer to the big questions means these cultures develop in different directions. The conclusions they each draw help to shape their morality, cultural practices, and their perception of other groups.

If the Glutto and the Creedi are the main cultures in your world, and you concretely explain that one is correct, the audience will struggle to empathize with the others who are not. If you explain early on that gods are real, and they send down angelic prophets from heaven to teach people among the Creedi, then who is going to be interested in hearing what the obviously wrong Glutto people have to say? Even if they are the villains of the story, it's better when you can at least understand the motivations of the antagonists.

This situation gets more impactful with individual characters in your world. If chapter three includes a conversation between the gods, and then chapter four starts with a Glutto character spouting nihilism, your audience may just get frustrated or bored with the character. He



doesn't know what he's talking about, right? So why are we wasting our time reading the misguided Glutto's ramblings?

One main exception here is allowing for a misguided character so that they can develop during the story. Han Solo is introduced as a huge cynic when he first shows up in *Star Wars*, particularly about the Force. But, very soon, this attitude changes and he becomes a believer. His acceptance of the greater truth is tied in with his developing empathy and trust, and his personal growth is satisfying to see. That sort of arc may not have been possible without him first being cynical of the Force.

Even without conflict, including myths in storytelling can help to create empathy with your characters. Let's imagine the night's sky of another world, one in which the stars shift each night to create new shapes, patterns, and voids. Staring upwards, they seem motionless. Yet, when dusk arrives each day, the universe has provided a new smattering of celestial dust for the world to gaze upon.

Here, you have two options: to explain what's happening or to see the unexplainable through the eyes of characters:

1: After the feast, the village matriarch gathers the children. She fixes their gaze skywards and weaves tales of the meanings behind the patterns of the night. They provide guidance for the tribespeople and warn them of dangers to come.

2: In reality, it's solar winds creating random punctures in the atmosphere through the day, creating the illusion of a sky filled with fresh stars come nightfall.

If the point of worldbuilding is to help create an interesting and engaging world for your readers or players, which of the two options sound better?



Really, there's no right answer. But, with our first option, your audience will see your world through the eyes of these village people. There's no reason they must know how the stars really work, just like most people on our Earth can't tell you about the inner workings of stars.

Even in the real world, with our telescopes, satellites, and generations of research, we still have secrets to discover. We still look up at the night's sky and wonder what's out there.

What matters is helping people to empathize with the villagers—to feel as lost and confused, yet as curious and optimistic as the characters.

CULTURAL CONFLICTS

The ability to create diversity among cultures is largely what having distinct groups of people in your world is all about, right? If you're adding greatly different cultures for pure aesthetics, then go ahead. There's nothing wrong with it, and at worst, you're adding a nice splash of color to your world's cultural palette. But the way I see it, you delve into different cultures largely to see what happens when they collide. And these collisions can create a range of different reactions.

Are they oil and water, never mixing when put together, no matter how hard you stir it up? An animistic culture, which believes in a universal spirit, meeting a hive mind of ant-people may not have anything to fight over, but they may also have nothing to agree on either.

Or worse, are they bleach and ammonia? Two substances that must be kept apart for fear of the chloramine gas that may emerge from the clash? A society that worships the sun would

PERHAPS IT'S BEST TO USE MYTHS, AND HAVE THE CHARACTERS LEARN THE BIG SECRETS AS THE AUDIENCE DOES.

find itself at odds with another that considers the sun to be the ultimate source of destruction, burning and dehydrating the world. A person from the latter culture may be horrified to see the other people's rituals, as they dance and sing praises to a supposedly benevolent sun.

Or, lastly, can the cultures function like paints? Someone from the Blue Lunar Empire meeting someone from the Tribal Reds of Mars could create something new. A change in each of those characters, where they both end up as part of the Purple Rebellion, the seekers of a new Truth.

So who's got it right? Honestly, who cares? Let conflict be conflict. It's more interesting that way. An unprovable myth is a time-tested way to create zealotry in people. To rile people up enough to get them to fight against those telling "lies."

SECRETS AGE LIKE WINE

The final reason to pump the brakes on explaining cosmology is to keep your options open for later. As you turn a worldbuilding project into media you share with other people, you can keep things vague and slowly uncover the truths as the story progresses.

The joke in a lot of media is that your main character starts by clearing rats from a basement and finishes by killing a god. It's a cliché that works well for a lot of epic fantasy. You're introducing your audience to a whole new world, full of new rules and terminology to get to grips with. Starting a story with a Hobbit in a village, or three orphans in 1940s England, or a teenage boy on a desert planet, not only helps to fulfill the rags-to-riches story arc, but it allows you to

drip-feed your worldbuilding to your audience. You can explain what's normal to these characters before taking them, too, on a journey of discovery.

Keeping things vague also means you can take your setting in different directions. You can be inspired for a late chapter while you're in the middle, and you're not dragged down by a possible inconsistency. If you say early on that the sun is, in fact, an angel whose job involves protecting and nourishing the world, it's hard to then turn around and say "no, wait, it's actually a portal to another universe."

Finally, your audience will have a greater desire to know the truth if different groups are espousing radically different beliefs. Who was right all along? Characters have been killed over this disagreement, especially some of my favorites.

So, when do you detail the cosmos?

There's no concrete answer here. The worlds of Middle-earth and Narnia both feature wonderful, inspiring cosmology. Whereas other stories, like Harry Potter, barely touch on it and still manage to create an engaging story in a fantasy world.

Ask yourself why you want your audience to know a detail about the universe. Whether you're writing a novel or running a roleplaying game, you constantly make decisions about what information you think is important for the audience to know.

What's the setting of the story? A tribal village is likely to have myths, but a secret, scientific foundation of learning may have already uncovered the truths.

Is there a detail that foreshadows something major way later in the story? Perhaps it's best to use myths, and have the characters learn the big secrets as the audience does.

Is cosmology a central theme to your story? Well, you could go either way. You could have erroneous zealots whose beliefs are challenged, or you could explain the "playing field" of the cosmos and watch as the characters navigate it their own way.

Try not to take the audience too far into an expository rabbit hole without asking yourself why first. You may have an incredible universe to show off—but are people ready to see the whole picture yet?

 [BACK TO INDEX](#)



COSMIC SCRAMBLED EGGS

by B.K. Bass

 COSMOLOGY  SPACE  NATURE

How did it all begin? When did this happen? Where does everything come from? These questions make up one of the most hotly debated topics in human history: the origins of the universe, also known as cosmogenesis. While many of us might turn to science for answers today, the primary source people turned to for much of our history was religion. Depending on the particular tradition, accounts of the creation of all things vary greatly. However, a common theme appeared in many early mythologies across the world: the *cosmic egg*.¹ As we consider the creation of our own fictional universes, let's take a look at what this concept is, how widespread it is, conjecture why it became so common, and discuss why this sort of creation myth feels intuitive in modern times. Finally, I'll offer up a recipe for your own cosmic egg creation myth.

The creation myth motif of the cosmic egg (or *world egg*) involves the universe in a state of pre-existence—some sort of primordial unbeing—where there exists only a singular concept. Sometimes, this could be a mythological figure or divine being of some sort, or a creature, but most often it is an actual egg. This egg exists in a sort of pre-existential void, cosmic preternatural medium, or often an endless ocean. (Keep in mind that to ancient people gazing over the sea, it must have seemed endless.) In most cases, nothing else existed before the egg—it is simply eternal—although there are some rare exceptions where a creator deity produces the egg as an intermediate step toward the creation of the world.

¹ David Adams Leeming, "Cosmic Egg," *Creation Myths of the World: An Encyclopedia*, 2nd ed., vol 1, (Santa Barbara: ABC-CLIO, 2010).

For one reason or another, depending on the myth, this person, creature, or egg breaks open. What issues forth sometimes is the material that makes up our universe, but in most cases, this entity births a creator deity. In the former case, the material that issues forth then coalesces naturally (or supernaturally) into what we know as reality. In the latter, the being emerging from the egg begins crafting our reality. In either case, only the egg (and sometimes the oceans) before this step, and all that exists after does so because of the egg.

Cultures that gave rise to stories involving cosmic eggs span most of the world. The ancient Pelasgians of Greece believed the goddess Eurynome laid an egg called Ophion, which contained all of creation to protect the world until it was ready to hatch. This myth later evolved to a version where the egg birthed the first god, Phanes-Dionysos, who then acted as creator. In ancient Egypt, there can be found stories of a primordial ocean, and from this bulged a mound, which gave birth to the sun god, Ra, who then created all else there is. The Dogon myths from Western Africa say an egg was shaken until the embryo split into two embryos, and each new embryo bore a set of twins. These four deities would then go on to create the world. The Mandé people share a similar myth, but in their version, the creation of two sets of twins was an intentional act by an outside creator. In ancient India, tales say the creator—Prajapati—emerged from a golden egg created by the sea itself. The yin and yang of Chinese and Japanese traditions represent the division of all the aspects of the world from chaos, done so by a giant born of an egg. Other examples range as far as the Polynesian islands to Finland.

At its very core, the concept of the cosmic egg may be a rejection of the counter-intuitive idea of “*something from nothing*” seen in other cosmologies, which could explain its prevalence across so many cultures that had little to no contact with one another prior to developing these

traditions. (Those familiar with the monotheistic traditions still prevalent in modern society will note they are exceptions to this trend.) One could then ask, where did the egg come from? Or if so-and-so birthed the egg, where did he or she come from? Alas, none have managed to crack this egg. Another point leading to the prevalence of this motif is that among so many cultures whose very livelihood depended upon the natural world around them, the egg can easily be seen as a universal source of life. From fish to reptile to fowl, much of the animal life around us springs forth from eggs.

Counter to the intuitiveness of ‘life comes from eggs,’ we have the issue of our own lives, and those of the many mammals we have surrounded ourselves with, emerging directly from the womb. This leads down another path of creation myths—the *world parent*—and that’s just one of a number of different creation myth motifs. Today, however, we’re talking eggs.

Finally, looking back at the cosmic egg motif of creation from a modern lens, much about it makes sense. Setting aside the mythological explanations for a moment, let’s take a look at the most plausible solution offered by the scientific community: the *Big Bang*. According to this well-established theory, all the matter and energy in the universe was once contained within a supermassive singularity. Then, for reasons we do not yet understand, this singularity burst and issued forth all that we currently recognize as our universe. We don’t know what existed before the singularity, but most of us accept that everything we know came from it.

If you ask me, that sounds an awful lot like a cosmic egg.

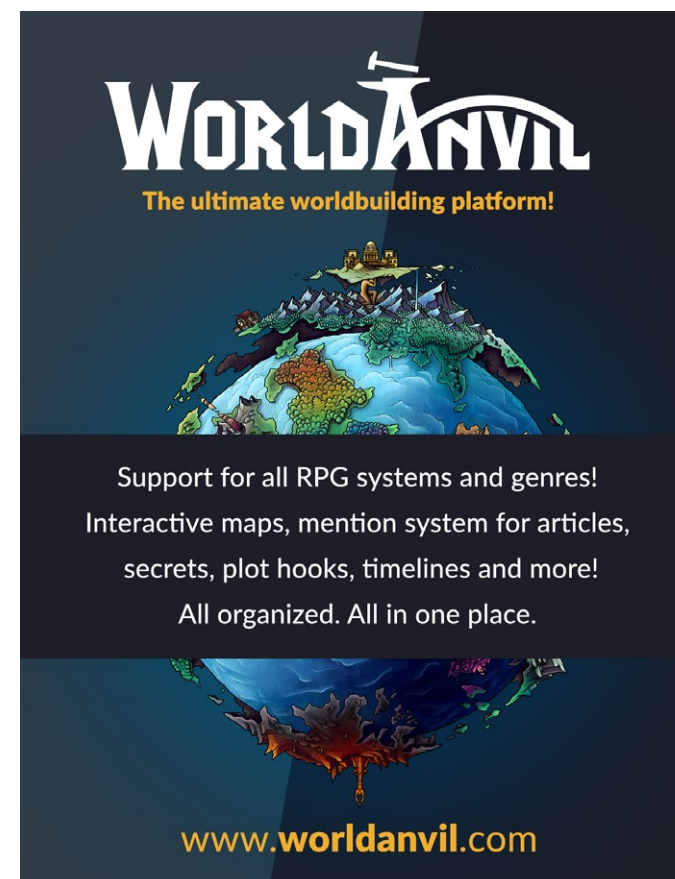
 [BACK TO INDEX](#)

COSMIC SCRAMBLED EGGS

Ingredients: primordial medium or water, one cosmic egg, an impetus for creation (optional)

Instructions:

- Start with a clean workspace devoid of any material existence.
- Either coat with an unfathomable primordial medium or bring an endless ocean into being.
- Add one whole, unbroken cosmic egg.
- An impetus for creation may occur within the egg itself, or you may evoke this from an external deity.
- Break open the egg.
- If all material existence issues forth from the egg, separate the constituent material into recognizable concepts, such as the land, seas, and sky.
- Alternatively, if a deity emerges from your egg, allow this deity to decide how to order creation.
- Season to taste with flora, fauna, and sentient beings with cultures. For added spice, you may add metaphysical elements, such as additional deities, the supernatural, and/or magic. (If your egg contained a creator deity, they should be in charge of this step as well.)





ALL THE THINGS THAT TREES CAN BE

by Eleanor Konik

 NATURE  RESOURCE

Trees and forests have captured our imaginations for millennia. From the sacred groves of the Celts to Tolkien's elves, Phoenician cedar to the Black Forest of the Brothers Grimm, trees play an enormous role in real-life cosmology. They also have tons of untapped potential when it comes to being useful for fictional characters and societies.

IN COSMOLOGY

The world tree is a vital part of the cosmology of many cultures. Typically, its branches extend into the heavens, its roots provide passage to the underworld, and the trunk allows for travel between the mortal realms and the realms beyond. The Hungarian *világfa* permits shamans to climb into the layers of the sky, into heaven and hell; its branches house the sun and the moon. The sacred *asvattha* is described in Hindu scripture as eternal, its roots spread upwards, its branches pointing downwards, having neither beginning nor end. World trees play an important role in Mesoamerican cosmology and are depicted extensively in Mesoamerican art. Northern Asia, too, has its myriad of world tree myths.

For an excellent example of how the desire for greater timber trade can be used to kick off an entire fantasy plot, see [The Raven Tower](#) by Ann Leckie.

 Photo by Marc Najera on Unsplash

Throughout human history, throughout the world, trees have been sacred and central to our understanding of the world. The World Tree. The Tree of Life. The Tree of Knowledge. Warden trees. Wish-fulfilling trees. Although most of the advancement of Western civilization has involved clearing trees rather than cultivating them, trees and their products have been as important as stone or metal throughout human history. Wood rarely makes its way into the archaeological record, but humanity would have had a difficult time advancing without trees, which provide timber for building homes and ships, fruits and nuts to feed us, and even the oxygen we breathe.

IN FICTION

Our truly fantastic fiction rarely reflects the role of trees in real life cosmology. Discworld rests on the back of a turtle, and even Marvel's *Thor* concerns itself more with the Bifrost Bridge than *Yggdrasil*.

When creating a fictional world that is not Earth, whatever genre, there are two main paths to take. The first mirrors Anne McCaffrey's *Pern* series, which has its complex ecosystem replete with all manner of invented organisms, from painkilling juices to empathic lizards to ravenous fungi. Although the dragons of *Pern* are key components of the storytelling, they are not a part of the food web that defines needlethorns or dolphins. L. E. Modesitt typically takes this approach with the sentient, magical soarers of the *Corean Chronicles* largely unconnected to the herder's nightsheep or military's pteridons. Works modeled off of folklore and myth, such as the *Garrett, P.I.* series by Glen Cook, often go this route. This approach is also true for riffs off of tabletop gaming, like *Nightseer* by Laurell K. Hamilton or most works by T. Kingfisher.

The other, more common—less complicated—method is to center worldbuilding around one

primary component. In the case of *Dune* by Frank Herbert, its sandworms, spice, and the planet's extreme desertification result from the sandworm life cycle. Robin Hobb's dragons were critical to every aspect of the ecosystem of the *Realm of the Elderlings*; from the acid-waters to the ship's timbers, everything traces back to the dragons.

WHEN WORLDBUILDING

Imagine a tree as firmly integrated into a world as the great reptiles that more commonly capture our imaginations. The Celts had their sacred groves; though this sort of reverence is often associated with elves in fantasy fiction; from Tolkien's *Lothlórien* to the fae curse "oak and ash" invoked by Seanan McGuire's *October Daye*, authors need not feel so limited.

Most people know that trees (like all plants capable of photosynthesis) function as air purifiers, taking in carbon dioxide and outputting oxygen. Dyson trees (genetically engineered plants designed to live inside of comets) and their ilk have been a staple of space-based science fiction as a way to facilitate asteroid habitats and generation ships for decades. In the same vein, trees provide vital access to heat in pre-industrial societies, via combustion and burning. But trees can actually do so much more: the Middle Eastern tamarisk tree functions as a natural air conditioner, cooling the air around it not just by shade, but by secreting salt during the day that then absorbs water from the air overnight. As the water evaporates, the surrounding air cools.

Of course trees provide food as well as air; apples, oranges, dates, almonds, olives, and coconuts are all well-known examples of produce. Reality takes things a step farther. For example: acorns are readily ground into usable flour, no wheat needed. The sap of palm trees is self-fermenting, resulting in a tasty and very popular wine that is very popular but unfortunately not shelf-stable enough to be appreciated by most of

the west. Sassafras teas and root beers are also tree products that could be enjoyed in lieu of the teas and coffees that typically appear in fiction.

From a liquids perspective, trees can purify water in a variety of ways. The image of a stranded seafarer surviving off of coconut milk is iconic, but modern aerogels let authors take this a step farther. Some aerogel varieties take their inspiration from trees, using capillary action to push dirty water upwards for the sun to evaporate, which produces steam that can be siphoned off as fresh, clean, potable water in emergency situations. Similar mechanisms could be used in science fiction or fantasy settings, with characters using trees as filtration systems.

Speaking of emergencies, despite our modern biases, trees provide an excellent building material. Popular in Japan because of its earthquake resistance, treated wood is incredibly long-lasting, and cedar was a vital shipbuilding material for millennia.

It need not just be elves who make their homes in trees; the protagonists of Bill Holbrook's long-running webcomic, *Kevin & Kell*, live in massive trees. Redwood trees, enormous enough to dwarf even the largest of humans and their vehicles, prove that it is possible for trees to make viable bridges (whether in their capacity as an interdimensional world tree or not!) and span roads.¹ As with Dr. Seuss's thneed, the possibilities are endless.

Tree-based clothes aren't just reserved for *The Lorax*, either—nor exclusive to the metaphorical fig leaf of Biblical Eden. The people of the Niger-Congo region of Africa have made cloth out of bark for thousands of years; though it predates weaving, it is still worn in Uganda and, when left undyed, has a beautiful terracotta hue.² Chinese silk would have been impossible without mulberry trees, and nuts like walnuts and acorns are incredibly useful for tanning leather and dyeing cloth.³ The oils of trees like cedar can be used to preserve textiles as well, acting as a repellent to insects that might otherwise destroy natural cloths.

But what about the magic? In some versions of lore, vampires can only be killed with wooden stakes—occasionally, only stakes of a particular type of wood. Dryads and other spirits sometimes inhabit trees, either symbiotically or as a single being. Sentient trees—ranging in intelligence from telepathic trees of *Avatar*'s Pandora (which is leveraged by recent research into plant communication),⁴ to Tolkien's ents, to Groot of *Guardians of the Galaxy* fame—riff off of this mythological trope. Folklore also brings us trees, like the Juniper Tree, that house the spirits of the dead and allow them a "body" from which to act.⁵ Naomi Novik uses this device to great effect in *Spinning Silver*, for example when the protagonist Wanda prays to the mystical white tree where her mother was buried for help—and subtly receives it.

¹ "The Myth of the Tree You Can Drive Through," Sequoia & Kings Canyon National Parks, *National Park Service*, February 16, 2017, <https://www.nps.gov/seki/faqunnel.htm>.

² "Ugandan Traditional Craft of Barkcloth Making. How to Make Fabric from Tree Bark," *Nationalclothing.org*, May 30, 2018, <http://nationalclothing.org/africa/76-uganda/289-ugandan-traditional-craft-of-barkcloth-making-how-to-make-fabric-from-tree-bark.html>.

³ Debby Greenlaw, "Let's Dye... Black Walnut," *Flora & Fiber*, September 6, 2017, <https://florafiber.live/blog/2017/9/6/lets-dye-black-walnut>.

⁴ Michael Forrester, "Scientists Find Plants Communicate Telepathically," *Uplift*, April 21, 2016, <https://upliftconnect.com/plants-communicate/>.

Trees, being biological constructs, are effective biological agents, which means they can affect human health. Narcotic effects are common, for example the G’Quan Eth of *Babylon 5* or *Pern’s* fellis juice; obvious expansions on folk remedies include willow bark tea. Larry Niven takes the idea of tree-as-medicine an enormous leap forward in his Known Space series—the Tree-of-Life (actually a bush resembling a yam) houses a symbiotic virus that triggers incredible metamorphosis in hominids, making them stronger, smarter, and functionally immortal⁶. Niven’s *Ring-world* also brings us “slaver sunflowers,” which function as solar-powered lasers able to target intruders with powerful beams of light, similar to the fire flowers faced in the *Mario Bros.* franchise.

Trees make for great obstacles in storytelling. The Whomping Willow of Hogwarts trapped Remus Lupin in his werewolf state and served as a guard of an important secret passage into the nearby town of Hogsmeade. Even without adding fiction to the mix of science, wildfires are an incredible danger, as shown by Janet Kagan’s *Mirabelle*—but *Hyperion’s* Tesla Trees take it a step farther by accumulating enormous amounts of electric charge in their onion-like bulbs, which they can then discharge into the Flame Forests.

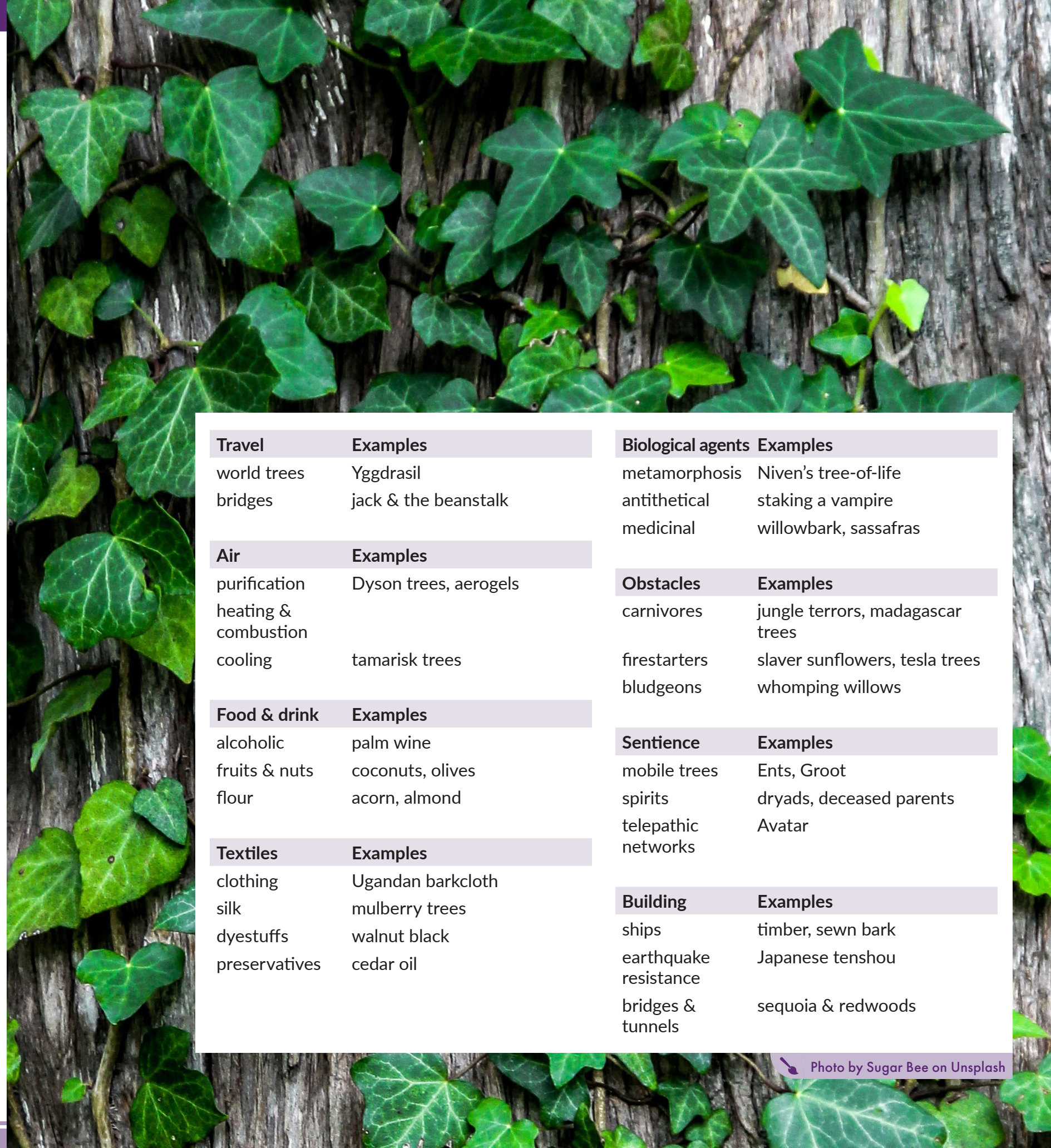
IN YOUR WORLD

Imagine a fantastical tree, central to a created culture, that can do it all. A tree that could facilitate travel between communities and dimensions, like Jack’s beanstalk or the World Tree. Imagine that its base could house its caretakers, its bark and leaves clothing its caretakers. Its very cells could purify the air they breathe, perhaps rendering an otherwise hostile environment, like space or a magical dimension, livable. Such a tree might provide food, in the form of nuts, berries, or even the fleshy pulp, and drink as well. A root tea that purifies the water it touches even more thoroughly than boiling is not inconceivable. Such a tree might offer danger and salvation, inspiration and comfort. It would doubtless play a key role in the cosmology of that society’s people, whether it be large or tall, deciduous or winter-green, jealous of its space or cloned and grove-born.


 [BACK TO INDEX](#)

⁵ Jacob Grimm and Wilhem Grimm, *The Juniper Tree*, trans. D.L. Ashliman, January 2007, <http://www.pitt.edu/~dash/grimm047.html>.

⁶ Larry Niven, *Known Space*, 32 vol., (New York: Del Rey Books, Ace, Tor Books, and Baen Books, 1981-2009).



Travel	Examples	Biological agents	Examples
world trees	Yggdrasil	metamorphosis	Niven’s tree-of-life
bridges	jack & the beanstalk	antithetical	staking a vampire
		medicinal	willowbark, sassafras
Air	Examples	Obstacles	Examples
purification	Dyson trees, aerogels	carnivores	jungle terrors, madagascar trees
heating & combustion		firestarters	slaver sunflowers, tesla trees
cooling	tamarisk trees	bludgeons	whomping willows
Food & drink	Examples	Sentience	Examples
alcoholic	palm wine	mobile trees	Ents, Groot
fruits & nuts	coconuts, olives	spirits	dryads, deceased parents
flour	acorn, almond	telepathic networks	Avatar
Textiles	Examples	Building	Examples
clothing	Ugandan barkcloth	ships	timber, sewn bark
silk	mulberry trees	earthquake resistance	Japanese tenshou
dystuffs	walnut black	bridges & tunnels	sequoia & redwoods
preservatives	cedar oil		

 Photo by Sugar Bee on Unsplash

PLANETBUILDING

by Juhani Taylor

COSMOLOGY SPACE NATURE

An incredible amount of thought goes into the physical geography of our worlds: how plate tectonics create mountains, how climate and weather dynamics create rainforests or deserts, and how settlements are located on strategic rivers or coastal bays. There have been entire issues of *Worldbuilding Magazine* dedicated to those topics.

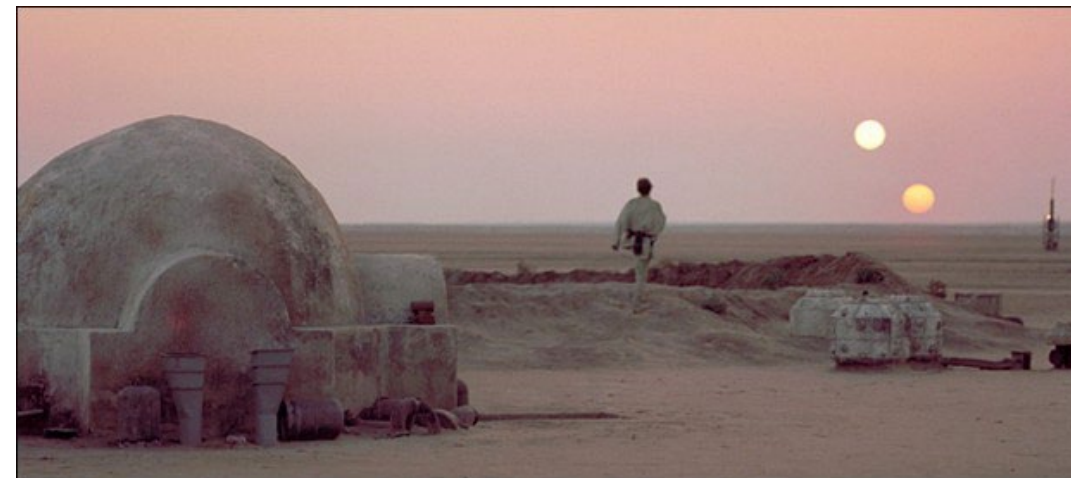
This article takes a step back from those processes and looks at worldbuilding on a grander and more literal scale: how do we build a world from scratch? What weird and wacky, yet plausible, worlds can and do exist out there in the universe? Let's go planetbuilding.

A small caveat before we joyride Sagan's Ship of the Imagination: we will only be looking at

Earth-like planets—i.e. those on which terrestrial-esque life could arise or those on which human explorers could survive with minimal life support. That means we will not be considering "Hot Jupiters" like HD 189733b, where molten glass rains sideways into hypersonic winds heated to 2,000°F (1,100°C) by its proximity to its star.¹ Nor will we look at planets where only extremophile bacteria could survive. Those are all awesome subjects for the right story, but for the purposes of keeping this article shorter than a book, they are excluded for now.

EYES IN THE SKY

There is a concept in physics known as the anthropic principle. It is sometimes used as a



STAR WARS, 1977

guide by scientists and, at other times, as a sardonic rebuff against their biases. The anthropic principle reminds us that we must be aware of our own limitations when attempting to understand the universe. An apt analogy used by physicist Brian Greene is to consider a fishing net with one-foot-wide gaps between the strings: when the fisherman examines his haul, he might conclude that all the fish in the sea are at least one foot across because that is all he caught. Of course, the hypothetical fisherman fails to consider the smaller fish which were able to slip through the net.²

The same principle applies to astronomy: just because our solar system has one star does not make it the norm. Scientists now believe that the majority of stars in the universe form as part of a binary star system, and it is even thought that our sun had a sibling that was later ejected by interactions with other nearby stars.³

Life in a binary star system can be weird. Planets in such a system fall into two categories: circumstellar (around one star) and circumbinary

(around both stars). Circumstellar planets rarely form in close binaries, as another star within 5 AU would disrupt their orbit (AU = Astronomical Unit; 1 AU = the distance between the Earth and the Sun; 5 AU is still close in stellar terms).⁴ In a wider binary where it is possible for a planet to stably orbit just one of the pair, residents would experience a fluctuating day-night cycle. For around half of the year, both stars would be on the same side of the sky, producing a brighter, hotter day. During the other half of the year, the planet is between the stars; the night sky is illuminated by its distant uncle star, much fainter than its parent star. For an Earthly comparison, imagine if Pluto were replaced with a copy of the Sun. For six months of the year, the night sky would be illuminated by the equivalent of a permanent full moon.

Circumbinary planets are perhaps easier to visualize and have a firm anchor in popular culture thanks to the famous Binary Sunset scene in *Star Wars* (1977). Here, the planet's orbit is so wide that it circles both stars as if they were one. The day-night cycle closely resembles that of a

² Brian Greene via World Science U, 2017: <https://www.youtube.com/watch?v=xPrpurvoX0Y>

³ Robert Sanders, 2017: <https://news.berkeley.edu/2017/06/13/new-evidence-that-all-stars-are-born-in-pairs/>

⁴ Yan-Xian Gong and Jianghui Ji, 2018. "Formation of S-type planets in close binaries: scattering induced tidal capture of circumbinary planets". *Monthly Notices of the Royal Astronomical Society*, 478 (pp.4565-4574). <https://arxiv.org/abs/1805.05868>.

¹ NASA, 2016: [nasa.gov/image-feature/rains-of-terror-on-exoplanet-hd-189733b](https://www.nasa.gov/image-feature/rains-of-terror-on-exoplanet-hd-189733b)

single-star system, except the two suns in the sky also orbit each other. An observer on this planet could watch the suns get further apart, then closer again before one eclipses the other. For this brief occlusion, the planet might actually cool a little, as the nearer star blocks the light and heat from the farther one.

Observations and simulations of circumbinary systems suggest that the planet's distance to the gravitational center of the system, the barycenter (more on that later), must be at least four times the separation of the two stars.⁵

So what might a circumbinary system look like to its residents? We can imagine a close binary where the Earth is replaced by a second sun, and Jupiter is replaced by an Earth (with a 24-hour day). The two suns take one year to complete a full orbit, while the Jupiter-Earth takes 12 years. Every 182 days, the suns eclipse each other. For two hours, the daytime sky dims until the other sun emerges again. Between these eclipses the suns drift apart, up to 11 degrees apart in the sky—about 20 times the width of the full moon. For those who know their constellations, that's about the distance between Orion's belt and his left shoulder (Betelgeuse).

THE VOID STARING BACK

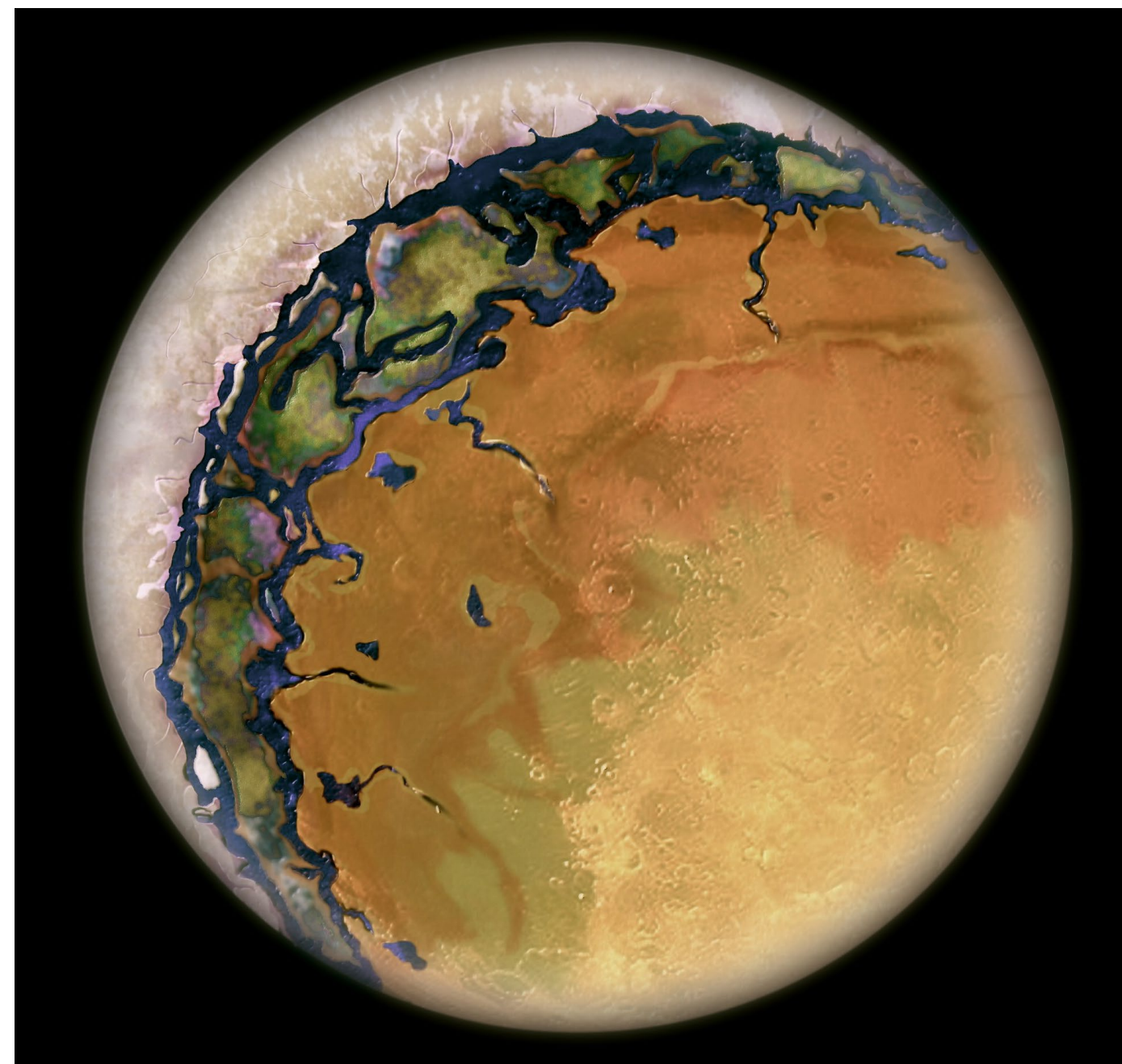
Another important phenomenon that is often overlooked is the effect of tidal forces. High school physics treats every object like a single point, with little concern for their volumes or shapes in the equations. Tidal forces happen when you consider a planet or moon not as a single point, but a large sphere. The pull of

gravity weakens with distance, so the part of a body closest to another body feels a stronger pull than the part furthest away. This process deforms the planet or moon very slightly into an ovoid shape. But the planet still rotates, so this bulge is not quite aligned with the other body.

Imagine a rugby ball or American football (depending on your sporting preferences) with a weight hanging from one of the tips. If you turn the ball, the weight will try to turn it back so it hangs at the ball's lowest point. This torque is exactly what happens between Earth and the Moon. When the Moon first formed, the Earth and it both spun much faster than they do now. An Earth day was only around 2.5 hours!⁶ But over billions of years, the flexing and deformation of both bodies absorbed some of their momentum, as did the friction of the tidal bulge of water on Earth against the crust beneath it. This effect slowed the rotation of both the Earth and Moon proportionally, but because the Moon is much smaller, it slowed down faster. Eventually it became tidally locked: only one side of the Moon ever faces the Earth. This effect carries on today, and given enough time, the Earth would also become tidally locked to the Moon.

Tidal forces are present in any object interacting with another gravitationally—including planets and stars. The Sun pulls on the oceans with slightly less than half of the force that the Moon does. We see this effect manifested in spring and neap tides, where the Earth-Moon-Sun alignment causes the ocean tides to amplify or partially cancel out.

In a planet orbiting close to its star, it could easily become tidally locked to its star in much the



BEAU.THECONSORTIUM. "WREEL"

same way that the Moon is to the Earth, which results in a strange world: an eyeball planet.

The hemisphere facing the sun roasts under never-ending daylight, scorched into a barren desert. The other side has frozen solid in a dark, endless night. Between the two lies a thin band of habitable land, where it is just the right temperature for liquid water to exist on the surface.

However, this strip is not a tranquil home for its inhabitants. In the desert, at the location directly

underneath the sun (the subsolar point), the air rises as it is heated. Cooler air rushes in from all directions at ground level to replace it, and the now-high-altitude warm air flows around the planet to the cool, dark side. Here, it sinks as it loses its heat and begins its journey back to the day side. The result is a ceaseless cold wind howling over the habitable band from the night side. This phenomenon would offset the planet's zones too, meaning that slightly more than half of the planet would be frozen, and the habitable strip would be an iris around the edge of the day side.

⁵ William F. Welsh, et al., 2012. "Recent Kepler Results On Circumbinary Planets". *Proceedings of the International Astronomical Union*, 8 (pp. 125-132). <https://arxiv.org/abs/1308.6328>

⁶ Lisa Grossman, 2012. "Fast-spinning Earth settles mystery of moon's make-up". *New Scientist* issue 2888 (27 October 2012). newscientist.com/article/dn22393-fast-spinning-earth-settles-mystery-of-moons-make-up/

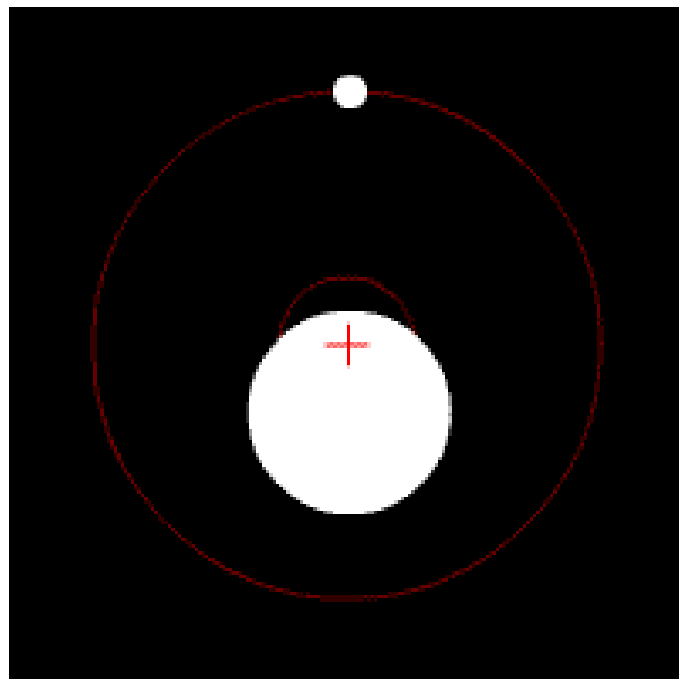
Residents here would adapt their architecture to the constant, unidirectional, cold wind, perhaps favoring large windows facing the unmoving sun hanging low in the sky. Instead of north and south, they might define alternative cardinal directions like “dayward” and “nightward,” and navigation would depend heavily on the vertical angle of the sun.

THAT’S NO MOON

The beautiful thing about so many scientific discoveries is that they start with a “*what if?*” question. Already we have seen two examples: what if a star system contained more than one star, or what if a planet were tidally locked to its star? Here we can consider a simple thought experiment: what if the Moon were bigger?

Our Moon is already quite large as far as moons go. At just over one quarter of the Earth’s diameter, it is the largest moon relative to its planet in our solar system. Mass scales with the cube of diameter, and the Moon is also, on average, slightly less dense than the Earth. As a result, it weighs around 1/81 of Earth’s mass. What if it were more massive? One tenth of Earth’s mass? One quarter? Half?

In every multi-body system, there is a location known as the barycenter (literally “heavy center” in Greek), which can be thought of as the center of gravity in that system. As an example of Newton’s Third Law, the Moon pulls on the Earth just as much as the Earth pulls on the Moon. The result is that the barycenter is not quite at the center of the Earth. By analogy, we can think of an Olympic hammer thrower. When they rotate to build up momentum, we notice that the athlete is “wobbling” as they turn. This is because the mass of the hammer is pulling on the thrower, so the center of rotation is somewhere near their outstretched hand. In a similar fashion, the Earth “wobbles” around its barycenter in response to the Moon’s orbit.



If the Moon were much larger, the Earth-Moon barycenter would be somewhere between the two bodies, instead of inside the Earth. The Earth would no longer wobble, but instead traverse a circular orbit around the barycenter. Pluto does this movement with its moon Charon, which is around 12% of Pluto’s mass. At the extreme end of this scale, a planet and moon with equal masses would orbit on the same path, 180° apart, around a barycenter exactly halfway between them. A planet-moon system like this can be referred to as a “double planet”, or “binary planet”. There is debate among scientists as to what constitutes a double planet versus a planet-moon system, but the most commonly accepted definition is a system where the barycenter lies between the two bodies, instead of inside the larger one. Thus the Earth-Moon system does not qualify under this definition but Pluto-Charon could. Indeed, astronomers debated reclassifying Pluto as a double planet before demoting it instead to dwarf planet status in 2006.

Let’s consider an Earth-like double planet system where the Moon is replaced by a planet of the same mass as the Earth. Let’s call this planet Nyx. These two planets would almost certainly be tidally locked to each other. On Earth’s sur-

face, Nyx would loom large in the sky, 4 times wider than the full moon and 4.6 times brighter.⁷ Nyx would never move, always hanging in the same place relative to the ground while the stars move behind it. One day on Earth would now last 29.5 old days; 354 hours of continuous daylight would be followed by 354 hours of darkness. Nyx would go through phases in the same way that the Moon does. All of this would also be true in reverse for residents of Nyx staring up at Earth in their sky.

PUT A RING ON IT

We can continue playing with the Moon in our thought experiment. So far we have changed its size, but what if we were to change its distance to us? The answer is that for most differences, not much would change on Earth. Tides would get stronger if it were closer, and weaker if it were further away. If the Moon were further than 914,000 miles (1.47 million km) from Earth, or about 4 times its current distance, it would escape from Earth’s orbit altogether. At that distance the Sun’s pull becomes stronger than the Earth’s and the Moon becomes a free planet in its own right.

But if the Moon were much, much closer, weird things happen. Suppose we magically brought the Moon down to just 5,900 miles (9,500 km) away (measured between the centers of each body - surface to surface would be only 870 miles (1,400 km)). At this distance it takes up a monstrous 51 degrees of the sky, more than a quarter of the distance from horizon to horizon. But at this distance, it crosses the Roche limit.

Scientifically, at this distance, the tidal forces of the two-body system exceed the Moon’s gravitational self-attraction.⁸ In other words, the pull of the Earth on the nearest part of the Moon is stronger than the gravity holding the Moon together in one piece. So the Moon starts breaking up. Anyone on the Moon would see mountains of rock literally rip off the surface and float away into space. Within a few months, the Moon has been completely disintegrated and in its place is a shimmering set of rings encircling the Earth.

Unlike Saturn’s rings, the Moon’s remains would be almost entirely composed of rocks. Any ice locked up inside the disintegrating Moon would quickly evaporate because of the Sun’s heat. Saturn can maintain its icy rings due to its greater distance from the Sun.

People on Earth would wake up to a very different view of the sky. Exactly what you see depends on your latitude: at the equator you see a thin, white line cutting the sky perfectly in half from east to west. At the other extremes, near the poles, you likely see no rings at all, as they would be below the horizon. Between the polar circles, however, the sky is spectacular. Sunlight reflected off of the rings illuminates the night sky, as if you were in a brightly-lit room. The rings cast shadows on the Earth in daytime, and their constant, unmoving presence almost certainly becomes a mainstay in Earth’s mythologies. Space exploration becomes much more difficult, as any orbit between 620 miles and 7,500 miles (1,000 to 12,070 km) passes through the rings twice in each orbit at relative speeds measured in kilometers per second. Charles Q. Choi has an

⁷ [Author’s calculation, based on:] NASA Jet Propulsion Laboratory, s.d. “Measuring the Supermoon”. <https://www.jpl.nasa.gov/edu/teach/activity/measuring-the-supermoon/#>

⁸ Édouard Roche, 1850. “La figure d’une masse fluide”, pp. 243-262 in *Mémoires de la section des sciences*. Montpellier Academy of Sciences and Letters. https://books.google.co.uk/books?id=UmoVAAAQAAJ&source=gbs_navlinks_s

excellent write-up of the wide-reaching effects of such rings in his dedicated Live Science article, which is thoroughly recommended for a more in-depth look.⁹

It is also worth remembering that almost nothing in cosmology is fixed—everything is evolving and changing, just on astronomical timescales beyond human comprehension. So it goes with these rings. Over 100 million years, these rings would likely disappear through two mechanisms. Some lunar debris might eventually coalesce into new, much smaller moons. This phenomenon has already happened with Saturn, which has five small “shepherd” moons within its rings. The rest of Earth’s rings, too close to the planet to interact with each other, will eventually spiral down through tidal effects and drag from the extremely tenuous atmosphere up there in a process known as “ring rain.” Inhabitants of Earth throughout this whole period will be used to countless, regular shooting stars appearing parallel to the rings in the sky.

to house human residents with little more than gas masks for protection. Once again, science fiction has beaten us to this concept with the Cloud City on Bespin from Star Wars. As ever, we must remember how much of a leading role science fiction plays in science itself. If you can design a work-around or solution for a problem using hand-wavy story logic, you might inspire the next generation of scientists to make your ideas a reality.

 [BACK TO INDEX](#)

INFINITE IMPROBABILITY

This article has provided a mere glimpse of the bewildering variety of planets that can exist throughout the universe. There are many, many more besides those described above, all of which have the potential to provide epic settings for our stories.

A final piece of advice for anyone inspired by these possibilities: consider how a technologically-advanced civilization might overcome the challenges of an otherwise hostile planet. For example, the surface of Venus is a hot, acidic, crushing hellscape, but scientists reckon that airships floating high in its sky might be able



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⁹ Charles Q. Choi, 2020. “What if Earth had rings?”. <https://www.livescience.com/what-if-earth-had-rings.html>

HERO’S JOURNEY CHALLENGE WINNERS

hosted by World Anvil

 **CONTEST**

We’re happy to announce that Worldbuilding Magazine is continuing our partnership featuring contest winners from World Anvil’s Community Challenges! This time around we have the winners from their Hero’s Journey challenge! Each winner created an article about a hero from their worlds. We had a blast reading through the winners’ articles and are thrilled that we get to share them with you as well!

If you’re interested in participating in future contests, swing on by World Anvil and keep an eye out for the next one.

ANNQYUN ULIJWA (A.K.A. THE REBORN)

by Isaac Thompson

“When that kid groaned on the bloody steps, it echoed like thunder. We thought the priests had botched their execution. And I suppose in one sense, they did.”

— Fyaalash Ulaavtya

Annqyun Ulijwa was an elf living on the island of *Qariy* in northern *Thurásin*. They lived a short but eventful life, being responsible for starting

the riot at the Grand Church which ultimately led to the island being freed from the control of Xiy Kiiquldast some 30 years after their death.

HISTORY

Annqyun was born in 46 Growth in Iruva, the largest city on the island of Qariy, with their upbringing being similar to many Qarimii living under the thumb of Xiy Kiiquldast. They were required to attend a school in which the curriculum glorified the republic, and demonized the previous rulers of the island, which stressed the importance of sailing and magical prowess to being a worthwhile citizen.

Unfortunately for Annqyun, they had a [condition](#) which prevented them from casting any magic and found themselves to be a mediocre sailor. When they failed an important test of their ability in 56 Growth, Annqyun was removed from their family to be sent to a specialist school in the island's west, with the goal of finding them a way to be useful to the vast fleet the republic demanded. The following years were spent in frustrated boredom, as every manner of topic was taught in the hopes they would show an aptitude.

This situation changed with an outbreak of [Rainbow Plague](#) throughout the continent in 63 Growth, which quickly spread through the naval network to infect Qariy. Before most could even react, the disease had reached the specialist school, and its doors were locked tight in the hopes of preventing its spread in the rest of town.

After a few weeks the doors were reopened by the city's leader, expecting to find naught but corpses. To his surprise, a survivor emerged from the ravaged school — Annqyun. Their miraculous survival caused them to be brought to the Grand Church in Qariy to join its priesthood, to lead regular prayers and rituals designed to ask [the gods](#) for aid. They were called upon to nurse many of the sick and found this work the most rewarding, though their lack of magic made their work extremely difficult.

OUTCAST

Though it seemed Annqyun had found a place, being a member of the priesthood did not suit the rebellious teen. Far from making them more loyal to Xiy Kiiquldast, seeing how its most powerful church operated only made them hate the republic all the more. When the books in the church library showed them the forbidden perspective of long-ago Qarimii writers, they resolved to remove the republic from the island and restore it to glory.

While their ambitions were grand, their efforts were quickly noticed by the higher-ups, and Annqyun was thrown out of the church. They returned to Iruva to find their family had perished during the peak of the plague. With nowhere to go, they turned to pretty crime and odd jobs to get by, all the while keeping an eye on the movements of the Xiy Kiiquldamii officials and priests. Growing unrest on the island made for convenient chaos to hide Annqyun's actions for a time.

Early in the year 2 Famine, the robbery of a priest from the Grand Church sparked a fierce investigation. During its course, Annqyun confessed to the deed and returned some of the stolen goods, saying they had pawned the rest off for food. For this grave crime, they were taken to the local church to be executed, part of a list full of petty criminals and rebels. When the day arrived, Annqyun caused such a fuss and ruckus among the prisoners that they were bumped to the top of the list. Taken to the top of the church steps before the deed, Annqyun's body was left to collapse onto the stairs and bleed on the stonework.

But when a priest went to drag their corpse away, Annqyun was not dead.

REBELLION

Suddenly missing their left arm and with their eyes alight with divine flame, Annqyun rose from the steps. Fire consumed the small church, and before the priests could begin to douse it, Annqyun had severed the chains of the prisoners awaiting execution and called them to run. Within moments, the only people left on the stairs were the confused church employees.

While many disregarded the events of the day as nonsense—after all, how could someone return from the dead?—some knew exactly what had happened. Annqyun had formed a [pact](#) with

one of the gods, exchanging a limb for magical power which transcended their magicless state and death itself. Divine assistance haphazardly acquired, Annqyun took a few days to recover before arriving to unleash similar power at another planned public execution. Prisoners of all sorts were freed en masse, with the priests never prepared to handle the arrival of the “demigod”.

But Annqyun would not stick to small-scale acts of arson and freeing prisoners. In the middle of 2 Famine, they riled up a crowd in Qariy's west and led them toward the Grand Church. As the largest monument to Xiy Kiiquldast's control over the island, Annqyun saw it as an insult to the local people. When priests attempted to prevent the riotous crowd from entering, they were harshly shoved aside, and Annqyun hurled divine fire at the building. Before long, the church was utterly ablaze, and its inhabitants were attacked by the rest of the crowd.

END

It was this act that finally brought them to the attention of the Captain of Xiy Kiiquldast, Thyan. Furious at the destruction of the Grand Church, she ordered her captains to search the island for Annqyun. When all attempts to apprehend them ended in injury and failure, a lower-ranked captain called Odha decided the only way to fight someone in a pact with a god was to form one himself. At the smoldering remains of the Grand Church, he made a request for power from the Duality of Knowledge, asking for the knowledge to find and defeat Annqyun.

With divine knowledge acquired, he and Annqyun began a cat-and-mouse game across the island, with Annqyun often humiliating the proud captain at every turn. Multiple traps were laid, but none were successful until late in the year.

In the second to last month of the year, Odha had a building's interior reinforced with iron

coated with silver and gold to disguise it, and ordered a set of executions to be held there. As predicted, Annqyun refused to allow the event to continue and arrived in disguise to attempt to crash it. When they realized their magic was being nullified, they tried to escape, but they were captured by Odha and wrapped in chains.

They were taken to Captain Thyan's ship to be judged, though multiple attempts were made along the way to help them escape. Aboard the ship, Annqyun was branded as a traitor to the republic and sentenced once again to execution. This time, it would be at the burned steps of the Grand Church and take the form of a decapitation to prevent any possible chance of resurrection.

The deed was done on the final day of the year, despite the best efforts of the rebels Annqyun had fought for.

LEGACY

Though Annqyun's life was short, and their time in the national spotlight brief, their actions endured. Inspired by their victories against the republic, many Qarimii took up arms in the years following Annqyun's execution. Progress was slow, but by 19 Famine, they had successfully reclaimed the western half of the island from Xiy Kiiquldast and reestablished in some form the long dormant Governorate of Qariy. One of the earliest acts of the new government was to rename the city the Grand Church had occupied to Annqyiru, and many buildings and streets would bear their name in the years to follow.

When the island was finally rid of Xiy Kiiquldast in 31 Famine, the Qarimii pestered the government to build a great statue of Annqyun in the titular city. While work on this did not begin until 6 Disturbance, this delay allowed them to make it far grander. The final result, a 23-meter-tall copper plated statue of the heroic elf, stands at the bottom of the stairs leading

into the Grand Church and dwarfs the building's charred ruins and much of the surrounding city.

This statue has helped Annqyun linger in the popular consciousness, and they are a figure around which all in Qariy can rally behind. Many will travel to their statue to ask for their strength or to follow their example and attempt to form a pact with a god. While few are successful, it is common knowledge that visiting Annqyun before asking will raise your chances.

[Read the complete article on World Anvil.](#)

ANÄRIEL ANASTIL THE BLACK UNICORN

by J. L. Gryphon

WHO IS THE BLACK UNICORN?

Anäriel is the outcast phrasai of the Royal House Anastil. She is the youngest child of the late pharota and pharotu, Xanära and Ethäes Anastil; is the twin sister of Seéré the Lost Prince; and is the younger sister of Vänima the Veldriss, the self-proclaimed goddess of Orosta and Rhye. When Vänima rose to power after every Rhyastilian citizen over the age of fifteen was murdered, Anäriel escaped into the east where, over the next 150 years, she would become a myth known only as The Black Unicorn. This is when we meet her, but...there's a problem.

Anäriel is a character who doesn't know what she wants. She hasn't been pushed. She hasn't been made a hero yet. Her main conflict is not bad parents, a tragic past, or a dead loved one. Her main torment is she does not know herself. She has no idea who she is because everything she was burned in dragon fire. All she does know is she's a coward. Running is what she does best. But after 150 years of running, there's nowhere left to go. Sooner or later, she's going to have

to accept that. Then she's going to have to do something about it.

"For over five thousand years, my family has ruled Rhyastil. Five thousand years of history, legacy, but in one sweep it just...my entire family is dead. Or they have not been seen in a century, or they are psychotic tyrants. I am alone. I have been completely alone for 150 years. I am the last true Anastil. And that is a state that has been forced on me."

—Anäriel Anastil

SPECIAL ABILITIES

Sithu is the white fire burning on top of Sithuwaye blood—the source of their immortality. Sithu protects against illness and heals non-mortal wounds. While the fire is not normally hot, it can be weaponized if the Sithuwaye wills it, as seen with Anäriel's fire swords, Khasa and Erido.

If subjected to a state of extreme isolation or loneliness, a Sithuwaye's *sithu* can start to fade, and eventually, they can die. A sense of connection is as vital as water to the Sithuwaye people.

Psionics is the catch-all term referring to the powers of the mind, specifically telepathy and telekinesis. All Sithuwaye have these abilities, but power levels vary based on genetics. For Anäriel herself, her power is above-average but nowhere near the strongest. That honor goes to her sister...unfortunately.

Shadowstealers are people with shape-shifting abilities. It is not Sithuwaye-specific like *sithu* or psionics, and any race—except for dragons—may possess it. Due to its extreme rarity, it is largely mysterious to most people, even to those who have it, as almost nothing is known as to how or why the power manifests. There are theories, though...

THE PROBLEM WITH UNICORNS

Vänima: "What do you know about unicorns, dear?"

Kieran: "You mean...The Black Unicorn?"

Vänima: "Her, yes, but more so unicorns in general."

Kieran: "Unicorns? There's more than one?"

Vänima: "No, actually. But do you know why? The unicorn is anathema, a demon from the void, though it was not always so. Once it was beautiful. The undine scribes tell how it happened. A rogue star fell on the unicorn and possessed it, twisting it into a monster. It screamed as it was dragged into the void, but as it fought, it pierced its horn inside a tree. The tree bled, and magic poured out of the bark in sticky black gulps of tar. The unicorn battled to get away, but it was trapped. It drowned. When it finally had breathed its last, its ruined corpse crawled out of the blackened pool, and so it was anathema. Now it roams forever alone. Forever broken. The unicorn is white, a mangled echo of what it used to be, but when it turns black, they say it will be a sign of the end—the end of all things. Do you know what they call this unicorn, Kieran? They call it the Fallen Star. He is the opposite of Le Sair, the embodiment of strife and discord. He is his singular enemy. At least, according to the legends. Do you see now the similarities?"

Kieran: "Anäriel is your Fallen Star?"

Vänima: "Look at you starting to understand. Very good, dear."

PERSONAL HISTORY

Six years after The Battle of the Royals Dead, Anäriel is an outcast hiding from her sister. Unfortunately, she is discovered by Vänima's first iteration of Sicarius assassins, led by Cayl Sulissurn, and is chased into the menacing Morsus Swamp. Anäriel escapes the assassins, who are torn apart by a mysterious darkness, but soon finds herself lost. She wanders until she encounters a kelpie and battles him. Upon defeating him, she is granted a single wish which she uses to escape. The kelpie leads her out of the swamp into the wilds of the east—the perfect place to hide from Vänima.

In the east, Anäriel learns House Feldor has survived Vänima's mass slaughter. She travels to Castle Resena in the hopes she can reunite with friends, but upon arriving sees Willan Feldor conversing with an assassin. The reason House Feldor survived is revealed, and Anäriel flees, thinking she has been betrayed. It is 29 years later before she learns she was wrong, and in a terrible realization come too late, she sees the aftermath of House Feldor's coup against Vänima—Castle Resena reduced to a ruin and renamed Jersæg or "Example." Filled with grief, Anäriel loses herself in the east and begins a life of true, unending solitude, an extremely dangerous state of being for Sithuwaye who require companionship to live. Anäriel begins to go insane.

Fast forward 94 years, and Anäriel stumbles back into the west, a shell of her former self, unable to stand the solitude anymore. She wanders into the town of Clearbrooke and lives in a nearby jungle, entering cautiously now and again to purchase food. She hides from Vänima's ever-spying mirrors and slowly begins to find herself again...until a mirror does see her. Even after 123 years, Vänima's reaction is swift and brutal. She sends the red dragon Elghinyrrok the Judge to destroy the town, and Clearbrooke is reduced to ash. Anäriel sees an eight-year-old

boy floundering in the flames and, against her better judgment, pulls him from the fire. They run together, and the boy introduces himself as Kieran Quinn.

Aware of how unstable she is, Anäriel debates leaving Kieran at various orphanages they pass, but she can't bring herself to be alone again. Instead, she and Kieran devise a plan to locate and join the notorious Fisherhook Gang, a resistance group against Vänima led by a Sithuwaye named Chabaal the Fisherman for his tendency to "gut his victims like a fish." Anäriel supposes these are stories spread by Vänima to dissuade people from joining her enemy. Anäriel and Kieran find Chabaal's second-in-command, The Hood, in the western town of Isring. Taking a risk, Anäriel reveals her true identity to The Hood which allows them to join the Fisherhooks. Unfortunately, the stories of Chabaal were true, and Anäriel and Kieran are soon forced to flee the crazed murderer. Anäriel returns to what she knows and runs back into the east, taking Kieran with her.

"Her assassins are crawling all over the east nowadays. A sizeable host passed by my lair just yesterday, in fact. They were searching for someone..."

—Graxilyphet the Brown

Anäriel and Kieran live another 10 years in the east, but Anäriel tries not to notice the way a now-adult Kieran has started looking at her. Deciding Kieran needs exposure to other people, Anäriel summons the courage to return to House Feldor's ruined castle Jersæg. There she encounters a green mimic named Ree and his adopted human daughter, Cali. Anäriel joins Ree's ragtag thieving gang to give Kieran some semblance of a family.

Five years later, Ree hatches a mad scheme to rob the dragon Graxilyphet the Brown. Anäriel can't pass up the chance to add a dragon to her

shadowstealing repertoire and allows Ree to talk her into it. But upon meeting the dragon, Graxilyphet informs her there are assassins in the east, something before unheard of. Anäriel doesn't have to wonder who they are hunting. After all these years, her sister has chased her to the end of the line. No more running. Anäriel will have to choose between leaving her friends or staying, but the famous assassin Jezryn Sulissurn—a descendant of Cayl—has found Jersæg. This is where we meet our outcast hero, and the novel *Remember Dragons Lie Volume I: The Stag* begins.

[Read the full article on World Anvil.](#)

A teaser for the novel's first chapter can be found at the [author's website](#).

CONTACT INFORMATION FOR AGENTS

Anäriel Anastil is the protagonist of an upcoming crossover YA high fantasy novel titled *Remember Dragons Lie Volume I: The Stag*. The author J. L. Gryphon is currently looking for a literary agent in the interests of having the novel published. If any agent searching for new talent is interested in speaking with Ms. Gryphon, her contact information is listed below:

[Email](#)

[Website](#)

 [BACK TO INDEX](#)



BARROW SENTINEL

AN ORAL STORY

by Ike Riva

 FANTASY  HORROR

“I saw the man in yellow sitting, taut and cross-legged, under the shade of a barrow sentinel. Seaweed silver-green strands hung heavy from moss-covered branches, encasing his willowy figure in a silvered veil. The man's—the creature's—dirty, faded yellow cloak lay flung back over a shoulder so that it could strum a battered lyre. Eerie notes ebbed and flowed across the forest; a sylvan silence, in turn, filled in as chorus.

“The sun had dipped far below the horizon by the time the lyricist finished its unearthly song, and turned its true face upon the world. The cruel, ravenous animal emerged from beneath fair locks of hair and stood, unfolding its legs in triumph: no would-be heroes

 MIRANDA WHITE

had come to it during the day. Now, it lived to hunt another night. Woe unto he that ever sees such a beast creep from in between the silvered veil of a demon-lair as I did—setting out to hunt, wearing its true form, at ease in a familiar forest, dark and full of terrors! Woe unto he that ever sees the hues of scarlet in its bloodshot, man-starved eyes! Had I not found a dead oak and hid in it, as the Sybil said would come to pass—or slain a lamb before her incense-shrouded altar—the gold night-demon of the forest would have found me; my tale would have been lost to time.

“The once-man skulked off into the shadows of the great woods, in between twisted oak and elder pine. I prayed to the Goddess, for my life and for those of its victims. Its kind preys exclusively on man and does not return from a night until the sun has risen. I know this now, but did not know so then—the Sybil did not tell me, when the augurs were read.

“A sword of bronze,’ she’d croaked, ‘take it from the grave of a freshly-dead warrior and inscribe it with your true name backwards. Confuse the beast and it will not recognize its killer when it passes on to the life beyond. Otherwise, its spirit could haunt your soul until the stars die, and the world is forged anew...’

“The pommel of the sword was wet with sweat and crusted with grave earth—how long till I could move into the clearing? I heard that it came to those it hunted in silence. Could it still have been around me... watching, waiting?

“Run, I thought, but my feet were rooted like the trunk in which I hid.

“Run, I argued against my limbs, but the distance in between the tree and I yawned like an abyss.

“RUN!

“And with a jolt, I had cleared the bushes, running to the empty lair. I broke through the swaying walls of the den faster than I thought my legs could carry me. After all, a man who runs from demons must run like the devil himself...


“Then and there, under the shade of the barrow sentinel, I came upon the scarred bark of that ignoble tree: the sigil of bygone kings, now turned a cursed sprout that farmers burn for fear of haunting or possession. It was ancient, knotted like a furrowed brow, implying with its age a conquest of years. I do not know

how old it had managed to become, how long its mindless slave had sated its bloodthirst, but the bastard remains the oldest of its kind that I ever encountered. Only the Gods know for how many generations it’d brooded over its dark corner of the forest, the world swirling around it.

“I bent my ear to the ground to test if the legends could be true, since I still maintained hope that the darker tales of the world were unfounded back then. But I recoiled at what I heard. The heart...the heart of the tree was beating! And, now that I’d heard the rhythm, I felt it weakly through my feet, in the ground, and in the roots.

“Revulsion bubbled as I imagined the crimson and silver-veined organ pumping slime into the blighted growth. This, too, the Sybil had described; she was a keeper of the woodlore, holding the knowledge of generations. The sentinel was a foul thing used for witchcraft, a rot upon the earth. The sword had to be driven through the heart, I knew, so I began digging with it, as the she-seer had instructed. It was an eternity ‘til I hit the wooden heart-casing—until I touched the slick, darkened surface that strained audibly against its own savage beating.

“By the Gods, I still remember the groan that it made as I splintered the heartwood, even if I try not to. I can still feel the viscous, silver liquid that oozed from the porous and brittle heart-pulp onto my fingers. I can still smell the sickly-sweet odor of rotting flowers mixed with that of urine, so strong that my tongue could taste it. I can still see, in dreams most vivid, the thing beating with such force that, somehow, as I pushed the sword into its heart, I knew that it could feel pain and terror—and that it did so in death.



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“The creature must have, as well: felt, and died. Far away, like it had come upon its victims, death came upon it in silence. Whether it was turned to dust, like I have read, or was immolated spontaneously, like she said, it was gone. I burned the heart, and the tree burnt with it, heaving ash up at the nighted vault of stars.

“Many have asked me to show them the clearing and what remains of the demon-tree that set me down this path. But the land remembers the evils that plagued it. A shadow looms there to this day. Who is to say that the tree did not spread its seed far and wide on the tracks of that beast, that those who seek it out might not chance upon one of its sprouts?...Patiently waiting to work its sorcery on one of you—on any one unfortunate enough to chance upon it—and to use your mindless body to sate its thirst and become the corpse-tree itself?

“And, more importantly, who among you would not succumb to the delirious hunger that suddenly overcame me upon seeing that red and silver organ, and its flow? If I had not had the Gods and my wits by my side, I would have been convinced by the mirage. I would have eaten from the heart of the sentinel, and the terrors that stalked the night would have been twofold. If any saplings grow in the woods, they are better left alone and unseen...

“Let this be a warning to the greater among you: the dreams of red and silver still come to me in the darkest hours of the night. My trust in the long-dead she-seer wanes ever more by every turning of the stars. Is there truly any ruse that can last against an eternal hunter? Can the beast chip away at the walls of my mind until the end of days? What if the sword, and the name upon it—all of it—was a simple ploy to have someone do what needed to be done? I will know, but only at the end.”

 [BACK TO INDEX](#)

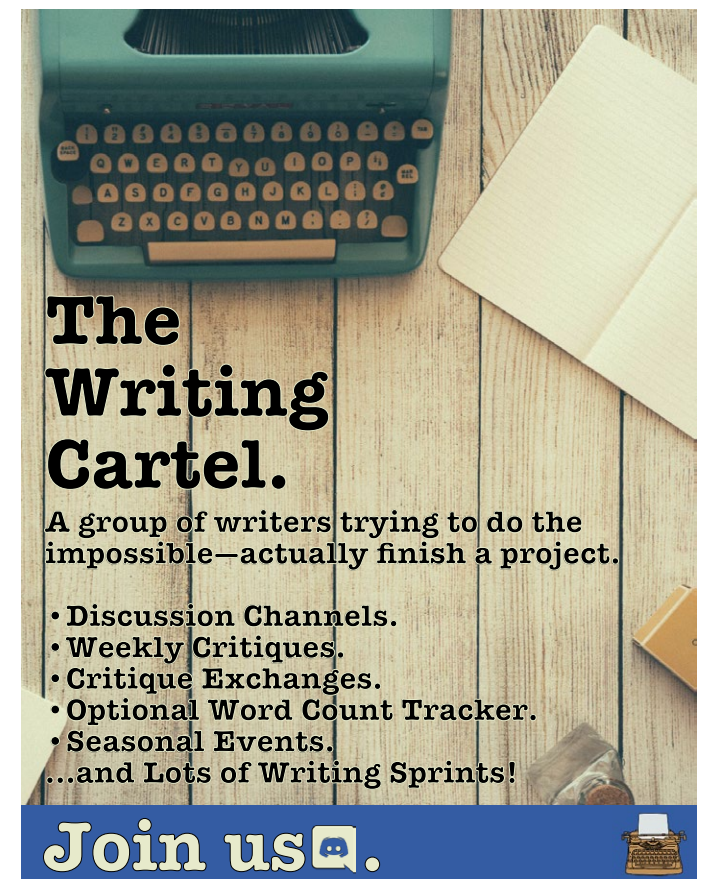
DIVINING THE HEAVENS

by Evan Mento

 [RESOURCE](#)  [RELIGION](#)  [THEORY & ANALYSIS](#)

The cosmos, regardless of how known or how explored, has intrigued not only modern humans since our creation, but also those in the fictitious worlds we create. For life to exist, there are a few prerequisites we think of. Oftentimes we model our worlds based on our own surroundings, with a burning star (or more) at the center that heats the planets pirouetting around its immense gravitational pull. Secondly, the planet needs to be within what is referred to as the “Goldilocks zone,” wherein the planet can sustain monuments of life, the largest of these being water. As in our world, there is often a moon (or several) depending on the planetary body’s size.


After the creation of such a solar system, populations begin to idolize what they do not understand, as humans did centuries ago. They often assign the colossal spheres that loom in the distance meaning beyond their scientific purpose. The most current example in our universe



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is the planets within our very own Sol system. Venus is named after the Roman goddess of love and beauty. It is believed to have been named after the goddess due to the planet's brightness compared to the other five planets that ancient astronomers knew of. The largest planet in our solar system, Jupiter, is named after the Roman god Jupiter, the king of the Roman gods.

Cosmology, the study of the stars, has been around for centuries, as many scientific citations date the first study of the stars back around 5,000 years ago. However, due to the limited knowledge in ancient times of the planets, those that shone brighter or were more massive next to their compatriots were granted significance in a religious sense, meaning that cosmology and religion often go hand in hand, as mortal beings define their neighboring celestial bodies.

BASIS FOR BELIEFS

An amazing example of the stars being used for a system of belief is astrology. Either dismissed as a sham or followed endlessly by self-proclaimed mystics, the basis of astrology in the present world gives us an idea for how cosmological placement of stars become constellations which, in turn, become symbols for beings like the dueling fish of Pisces or Aries the Ram that give some humans meaning. Daily, weekly, or monthly horoscopes dictate what is to come for a person born under a certain star sign. For believers, your signs determine who you would be compatible with — friends, lovers, or enemies — and even your attitude toward life, jobs, sex, etc. And it is all based on where the planets lie when you are born.

Even though astrology is not exactly a religion, it still gives a person a type of meaning and purpose similar to more followed religions like Christianity. The Bible depicted the Star of Bethlehem as a guide for the Three Wise Men in order to assist them in finding baby Jesus so that they could present three spiritual gifts. Even Jesus in his older years stated that “There will be signs in the sun, moon and stars.” However, this is already established in the world we live in. Using these as an example, you can create your own worlds with as many or as few established religions similar to these examples.

ASSIGNING MEANING

After the creation of your world or worlds, you have to look at the history of the populations that inhabit those islands of life. How long have they lived on this planet or planets? Has any major stellar phenomenon occurred in view of them? How does their culture affect how they perceive events they cannot understand, or can they understand them? Religion is often deeply rooted in the history of worlds we create, like the cosmos surrounding that world.

After you have answered this question — “What makes up your solar system?” — you can begin to grant meaning to the planets, moons, stars, etc. Keep in mind that even large-scale civilizations that are capable of interstellar travel, such as those in the *Alien* franchise, still have yet to discover a majority of space. In this vein, not every planet, star, black hole, wormhole, or any stellar object needs to mean something. Some objects are simply there to exist; one of the main questions from the universe that spurs religion is: who put it there, and for what purpose?

CONSTELLATION CONTEMPLATION

As the civilizations begin to advance scientifically, these assigned meanings can begin to change, or even break. This can determine where your worlds sits in regards to their understanding of not only itself, but the universe around it can change quite a bit. Not only can this bridge the gap between scientific understanding and wonderment but also as technology advances, religion often goes against the grain of the new scientific breakthroughs.

One example of this is Richard Morgan's book *Altered Carbon* (now a Netflix Original). Within the fictional setting of Bay City (or San Francisco), there is a religious group known as the Neo-Catholics who oppose much of the new technology that sprouts from the cyberpunk-dystopian society on Earth. But as interstellar travel became readily available, Neo-Catholicism lost many members and was only practiced on Earth (Sol).¹ As technology advances, many religious movements go with it; that being said, the cosmos has the power of being a vast endless expanse. Should your created world feature space travel, instead of conceptualizing a religion around an entity or a philosophy, try creating something comparable to worship but focused on the species expansion into the vast unknown. An example of this would be in the distant future where megastructures rule. Specifically, Dyson spheres or ringworlds placed around stars or black holes. The population of that planet might be entirely reliant on what they surround for power, light, and even life, and because of this,

they may form some kind of religion to this “higher being” to give them the basics for life.

However, even in the most advanced civilizations religion can be found, as is the case with the Star Wars universe and how “the Force” is essentially an ever-present being that a mortal can connect with through meditation (much like Taoism) and that connects the entire universe (akin to Buddhism). However, even in a fictional futuristic universe, we see those who do not believe in it; a prime example is again found in Star Wars, when Han Solo in *A New Hope* says “There's no mystical energy field that controls my destiny!”² This gives us worldbuilders near-infinite possibilities when it comes to connecting religion and the cosmos together. Where a futuristic Earth might be holding onto the roots of an old religion, what advanced civilizations take on to guide them might be entirely different. As both societies look at the cosmos and are set to unlock its secrets, how does that change or position their beliefs?

EXAMPLES IN YOUR WORLD

Beyond the aforementioned examples, there are still many things that cosmology can affect, such as how the entire world was created. Oftentimes cosmological bodies embody a god or goddess of something. When creating your world, both complexity and the number of cosmological bodies can determine many factors such as the number of gods there are, what the body signifies to your populations, and how the body has evolved over time. These stellar objects are

¹ Morgan, Richard. *Altered Carbon*. London: Gollancz, 2002.

² Star wars, Episode IV: A New Hope. Beverly Hills, Calif: 20th Century Fox Home Entertainment.

³ Siliezar, Juan. “New Theory behind Chicxulub Impactor That Killed the Dinosaurs.” *Harvard Gazette*. *Harvard Gazette*, March 2, 2021. <https://news.harvard.edu/gazette/story/2021/02/new-theory-behind-asteroid-that-killed-the-dinosaurs/>.

⁴ Wall, Mike. “We Finally Know When Our Milky Way Will Crash Into the Andromeda Galaxy.” *Space.com*. *Space*, February 8, 2019. <https://www.space.com/43267-milky-way-andromeda-collision-later.html>.

⁵ Byrd, D. (2020, October 15). Milky Way and Andromeda galaxies are already merging: *Astronomy Essentials*. *EarthSky*. <https://earthsky.org/astronomy-essentials/earths-night-sky-milky-way-andromeda-merge/>.

often a topic of discussion in today's world and are often debated by those with varying views as their meaning begins to develop between many different cultures.

This difference in beliefs has fueled debates for a little over a century and a half. One of these major bodies in discussion is the Chicxulub asteroid, or the asteroid that is said to have eradicated the dinosaurs, leaving a crater on the face of the Earth for eons.³ Nevertheless, those called fundamentalists believe that this never happened, which provides a counterexample to the rest of this article. Another example eons in the future from today is when our own galaxy, the Milky Way, and the Andromeda Galaxy collide, which will slingshot most of the matter into higher orbits.^{4, 5} If a major stellar event like this transpires in your world, how does it affect the inhabitants of those worlds or those viewing it from a safe distance? While on a time scale as massive as a universe's, these events often

transpire over periods unfathomable by mortal beings. The cosmos is an ever-expanding area with an infinite number of events happening consistently.

CONCLUSION

The basis of cosmology is not only the science of celestial bodies and how the whole universe functions, but a way for us worldbuilders to expand on the creation story of the continents, planets, and solar systems we create. As we see in many fantasy settings and real life, the stars are a place of wonder seemingly left to be explored by those who are brave enough to leave everything behind. Whether your societies are spacefaring, multi-system species or an early, high fantasy medieval civilization, the cosmos will always be a frontier of exploration and wonderment. From the earliest of civilizations on Earth, we have tried to conceive the meaning of our existence, often looking to the heavens for answers; the only difference is that in your fantasy worlds, the heavens might answer back.

 [BACK TO INDEX](#)

ASK US ANYTHING

by B.H. Pierce

This *Ask Us Anything* is presented by a senior member of the Amalgamated Order of Interdimensional Persons, Percival Aluminus Illumnius, Adjunct Professor of Gateways, 3423 WestNorth Street, Dunny-on-the-Spire.

What makes your worldbuilding good?

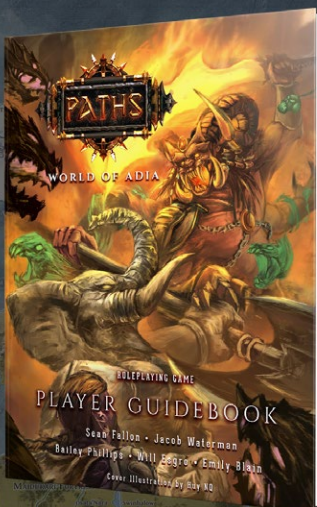
—*Aurimus*

Good worldbuilding is complex, multi-faceted, and deep. It should consist of pages and pages of detail, multiple languages, and extensive history. All subjects need to be incorporated from geology and physics to sewing and floral arrangement. Good worldbuilding should be indistinguishable from a textbook on a place and time in the mundane world. Since I can already hear one of my more clairvoyant editors banging on the door to my office, I will digress. While this is my dearly held opinion, it is only one, and one that only applies to worlds built for their own sake. In addition to being a fascinating and endlessly educational hobby, much worldbuilding is done as part of or as support for another work. It is in relation to that work that worldbuilding becomes good. Let us examine three examples from three different types of media: a novel, a tabletop game, and a film.


The vast majority of speculative fiction takes place in a world created for the story, and much of the rest takes place in an altered mundane world. The world is a backdrop that must be adapted to the needs of the story. A swashbuckling romance novella or a one-shot military science fiction piece need not put too much on display, as the audience knows what to expect. A sprawling, multi-book epic covering the fall of empires and the battle between universal

forces will require more of the world to be put on display. In both these types of stories (and the many in between), good worldbuilding influences both plot and characters, but does not supersede them. The temple where the final battle takes place must be fresh in the audience's mind not from a description as the final battle begins, but from plenty of groundwork done in the preceding chapters. In a written work, good worldbuilding makes use of all five senses. A meeting of secret lovers in a hidden forest grove is more impactful if the fragrance of summer flowers and the sound of a babbling brook is included. Even more so if the audience understands just how many barriers the lovers' culture has put between them.

Much of what has been said about novels applies to tabletop gaming as well. Worldbuilding must influence the plot and NPCs as well as make use of all five senses. But tabletop gaming is a collaborative experience, and the way you create your setting must reflect that. A good GM builds a campaign world around the player characters. If there is a Paladin sworn to exterminate the undead menace, there should be zombies crawling out of every potted plant. If the players want to travel wide and far, best get started on a world map. The setting of a tabletop campaign is an ever-evolving thing, so be prepared to world-build on the fly. If the players take a liking to a tribe of gargoyles living in a ruined castle, you have an opportunity to draw them in deeper. If they develop a deep hatred for a one-off aris-



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to be a tocrat NPC, maneuver him right into a place of prominence in your main villains' schemes. A world that your players can change and influence is a world that they will be engaged with.

Unlike novels or tabletop gaming, film is a primarily visual medium. While illustrations and battlemats bring a visual element to our previous two topics, they are intended to be viewed in the theatre of the mind. Film, on the other hand, is meant to be viewed in an actual theatre. Sets can be excellent examples of worldbuilding, communicating the mood and themes of the movie while sitting inert in the background. Sound design can make the world on-screen come alive with repeating instruments and cultural motifs telling the audience where the characters are without wasting a word. The costume department shines as well, outfits both simple and epic can put the richness, poverty, or technical advancement of a place on display with a simple flourish. Good worldbuilding in a visual medium is unspoken, but everywhere.

Now that I've bombarded you with examples to placate my editors, what do they have in common? While all these mediums are intended to tell a story, they all do it in remarkably different ways. While worldbuilding for its own sake is measured by detail, good worldbuilding must enhance the work it is part of. A two-thousand-word digression to explain the lineage of a one-scene character does not support the narrative. Players checking out to scroll through their phones while you describe the street layout of the next city does not improve the game. Each story, each medium will demand something unique

out of its setting. To be a truly good worldbuilder, you must find out what that unique thing is and crank it up to eleven.

Where does your inspiration come from?

—*Il Magnifico Barbarossa*

Oh, inspiration. Is there anything else in all the multiverse that is both so vital and so very useless? Everyone has ideas, some people even have great ideas, but few people ever bring them to fruition. So while inspiration can and does come from many sources, let's pair those sources with what can also bring the drive to complete a work.

CREATORS LOVE TO TALK ABOUT WHERE THEY GET THEIR INSPIRATION FROM AND THAT SOURCE IS OFTEN UNIQUE TO BOTH THEM AND THE PROJECT THEY'RE WORKING ON.

One source of inspiration is the Utopian idea. There may be some or many aspects of the mundane world that you would prefer did not exist or were more under control. For example, say you are a member of the Royal Society for the Prevention of Birds and you long for a world without the winged ingrates. Your inspiration drives you to study the place of avians in the world ecosystem and work out

ways they could be replaced by other animals or clean, friendly robots. Sharing your research with your fellow members of the R.S.P.B gives you more motivation as they cheer you on. Encouragement of like-minded people can go a long way to getting a project completed. Not that I would support such an endeavor, some of my best friends are egrets and I am 1/16th sandhill crane on my mother's side, but the point stands.

Similar to the Utopian is the What-if. In your daily routine, a question might flit across your mind that sticks with you. It could be something

simple or something profound, let's use a classic idea, 'what if intelligent, fire-breathing dragons existed in a world with modern technology?' You have your inspiration, but it is rather broad. Modern technology is a complicated thing and reviewing every aspect of it would take up too much of your precious time. So you settle on a simple goal, work out what a dragon's home would look like in this situation. After settling on the size of the dragon, you look into building materials and zoning laws as well as the multitude of other minor subjects required to answer such a question. By the time you're done, the dragon has a robust, two-story concrete home with a modern kitchen and plenty of yard space to take off and land on. Having a set goal to work toward can keep you focused on your project and helps keep you out of the odd research rabbit hole.

A final source of inspiration can be sheer necessity. You're already chest-deep in a project and you ram straight into a plothole. For the story you plotted out to continue, your characters need to reach a certain city by a certain time. But you've already established the travel times between places, and it doesn't look like they'll make it. It could be handwaved, but you know your eagle-eyed audience would take you to task for it. As you mull over your dilemma, inspiration strikes. When your characters were last on the move, it was spring, and they were traveling with merchants. Spring rains make the road muddy and merchants prefer to finish a journey with their wares intact. In summer the roads are firmer and now they're traveling with couriers, so of course they'd be moving faster. The story is served and the plothole cleared with no one the wiser.

Inspiration can come from anywhere. Dreams, hobbies, two-year-old magazines in waiting rooms, the list goes on. Creators love to talk about where they get their inspiration from and that source is often unique to both them and the project they're working on. Just like how their

process and motivation to finish will be unique to them too. Inspiration is only the first step on a very long journey. Once you have it, figure out how to run with it.

Is it a good idea to have more than one magical system in your story?

—*Imaginarian Darkstalker*

The phrase 'good idea' has no real objective definition (despite the best efforts of the Animanians), so answering such a question would be remarkably challenging. Which is what I'm here for. To be broad, a good idea is an idea that works, which doesn't help us all that much. It requires observation after the fact, and I'm certain you don't want to wait for your story to be finished to find out if it's a good idea. To answer this question, we must examine both the magic system and your story.

What makes the magic systems different? Is it their source? Can some magic flow down from the gods on high and up from the ground under your feet? If you have multiple gods, do they each patronize a different form of spellcasting? Could their process be what makes them different? Is one magic cast by hours of chanting in a darkened room while another is brought forth by dancing in the sun? If they come from the same source and are cast by the same process, perhaps it is their effect that makes them different. One enhances and improves, the other reduces and decays. The exact way these systems differ from each other will go a long way in determining if having them is a good idea. If they're mostly the same, there's no real point in causing confusion by having more than one. If they vary widely by Source, Process, and Effect then reinforcing their differences in the story would be wise.

Which brings us to another question: why is having multiple magic systems good for your story? If you're focusing on themes of diversity, having multiple forms of magic works very well.

In story, a system of magic can be thought of as evil or useless only to be uncovered or redeemed by the main character. Multiple systems of magic can do a lot for the plot and the setting as well. A main character needing to learn multiple forms of magic to do whatever they need to do is a plot that practically writes itself. It gives the audience a structure that's easy to understand and follow. As for your setting, many schools of magic can go a long way in explaining why magic is the way it is. Perhaps in the distant past, a powerful figure learned every type of spell and used magical might to bind the world together into one state. Or the opposite, so many different kinds of magic mean no one person or faction can take control of things. If having more than one kind of magic system supports your Themes, Plot, or Setting, then it would be a good idea to have them.

Say you meet all these criteria. The many magic systems have wildly different ways of being cast that both supports the themes of your work and enables the plot. There is still one barrier before you can consider multiple magic systems a good idea. Magic, high tech, and other powers are all the enemy of Consistency. Fantastical abilities, especially those that are not unique to a single person, raise all kinds of questions about the setting and the plot. If making an ever-burning fire is a simple trick, why do people still use firewood for their hearths? The drama of a character being chased through the woods is ruined if the audience is wondering why they don't just use their teleport magic to blink away. I can't give a solid response here because the answer will rely on the interplay between your magic systems, your setting, and your story. The best advice I can give is to take a close look at what your magic can do to find out if it creates plot holes that damage your story. If it does not, then you can be certain you have a Good Idea on your hands.

 [BACK TO INDEX](#)

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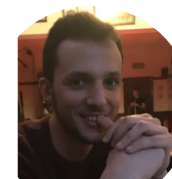
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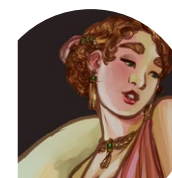
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No I'm not a robot, what makes you think that?

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JOIN OUR TEAM

A hand holding a quill pen against a starry night sky background. The hand is positioned on the left side of the frame, with the quill pen pointing towards the center. The background is a deep purple and blue gradient with scattered white stars. In the lower right, a silhouette of a person in a cape and armor stands on a rocky surface, holding a sword.

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