

CLASSIFIED

PROJECT HAIL MARY



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AN INTERVIEW WITH ANDY WEIR

What inspired *Project Hail Mary*?

Honestly, it was a collection of story ideas that I had for other books. Several of them came from my abandoned novel *Zhek*, while others were concepts for future books I had in mind. I didn't even imagine they would go together but then each one clicked into place and they really worked together well.

What kind of research did you do for this book? Did you run into any biology or physics problems that you couldn't tackle with Google and a calculator?

I did an enormous amount of research on biology and relativistic travel. There's a lot of fun (to me) math involved in working out how much fuel is needed, and the time dilation effects the ship would experience.

I was able to get most of the information by researching stuff on my own. But I ran into problems when I started trying to understand the details of neutrinos. Fortunately, a high school friend of mine went on to become a neutrino researcher who was actually part of a project that won the 2015 Nobel Prize for physics. So yeah—handy to have someone like that in my contacts list.

Also, there was a lot of astrophysics involved—the exact behavior of stars and how they worked, as well as how astrophysicists do their job. All of that was important to the story, so I spoke to astronomers and astrophysicists to get insight into their daily lives.

For *The Martian*, you wrote programs for calculating how much thrust Watney would need to get off Mars, and plotted actual launch windows. And for *Artemis*, you sketched out the entire physics and economics of a lunar colony. Anything similar for *Project Hail Mary*?

Of course! The research is my favorite part!

For this one I had piles of spreadsheets to calculate everything I needed. Not just the space travel stuff, but also the biology of *Astrophage* itself. How much energy does it need to store to be able to migrate to other planets to breed? How much energy can it absorb? What is the internal pressure on its cell membrane caused by the neutrinos it's using to store that energy? Lots of fun.

***Project Hail Mary* pushes the science-fiction elements of your writing further than in *The Martian* and *Artemis*, where you were making the minimum extrapolations to existing technology and concepts. How did you go about tackling those elements? Specifically, how do you keep things feeling real and believable, while pushing the ideas so far?**

For me the trick is to have big concepts coming from small concessions. There aren't any violations of physical law in *Project Hail Mary*. The only change to reality is a life form that has the ability to corral and store neutrinos. Everything else flows from that.

(continued on next page)



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With such a small suspension of disbelief (one that only people with a strong physics background will know is problematic), it's easy for the reader to buy in to what's going on.

You've said that Mark Watney is much more courageous than you are. Is the same true of Ryland Grace?

Actually, Ryland is about the same level of courage as me. Namely: not much. He doesn't know why he was put on the mission and doesn't really want to be there.

You seem to delight in choosing heroes who feel completely out-matched or unsuited to solving the problems being thrown at them, then showing how they can rise to the occasion. Are you consciously drawn to underdogs—or to choosing protagonists who aren't the typical swashbuckling action hero types?

I think we all are. While it's fun to watch James Bond kick ass, we don't really identify with him. Most people—myself included—feel overwhelmed by life from time to time. And we can more easily understand and empathize with a character who is in over their head and barely keeping it together.

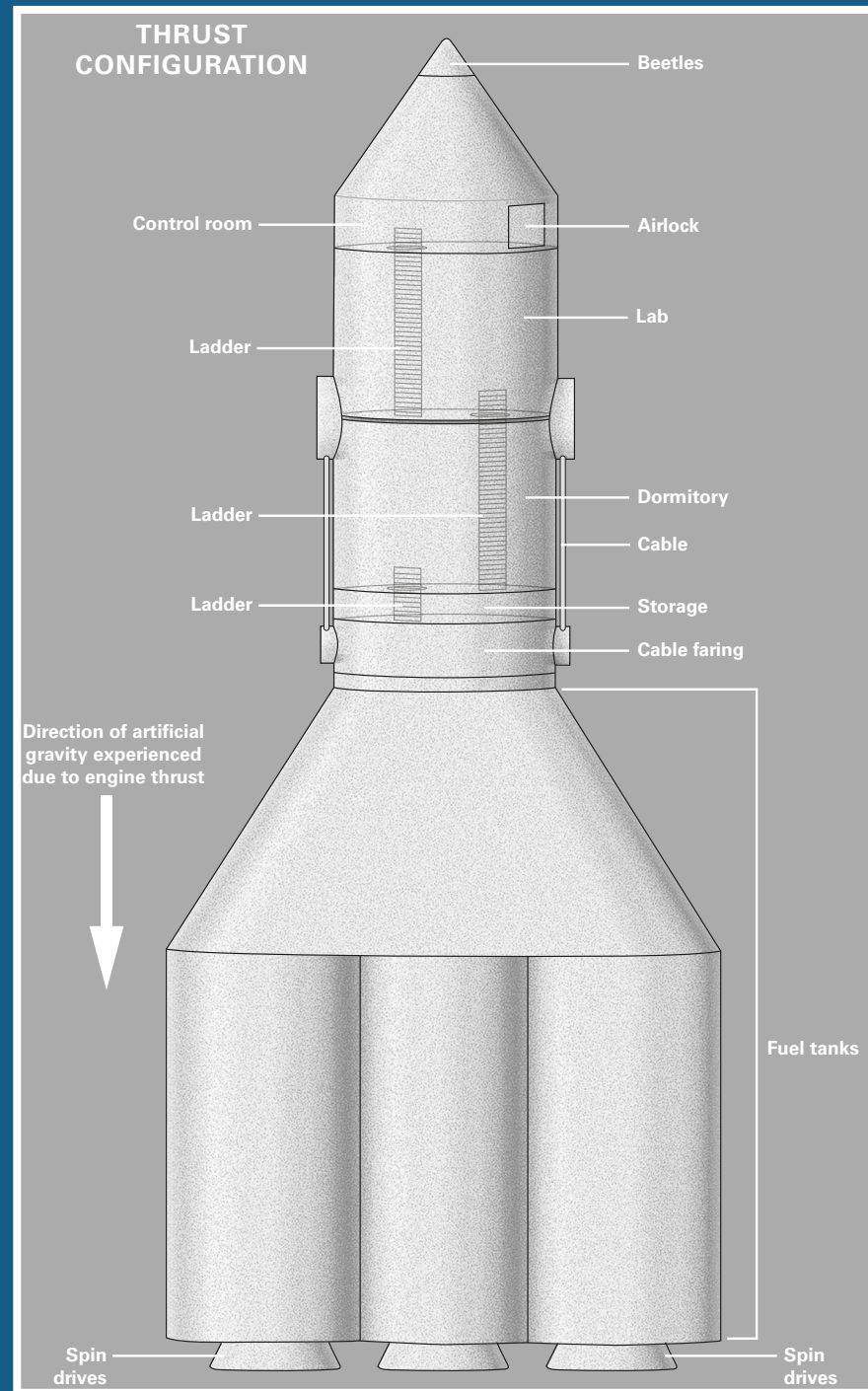
How did writing *Project Hail Mary* compare to writing *The Martian* or *Artemis*? Was it harder? Easier?

It was harder than *The Martian*—that book was a breeze to write. Pure fun. And it was easier than *Artemis*. The plot to *Artemis* is intricate enough that I had to stop and rethink parts of it pretty often. Plus I had a lot of rewriting for *Artemis*. *Project Hail Mary's* editing process was fairly straightforward.



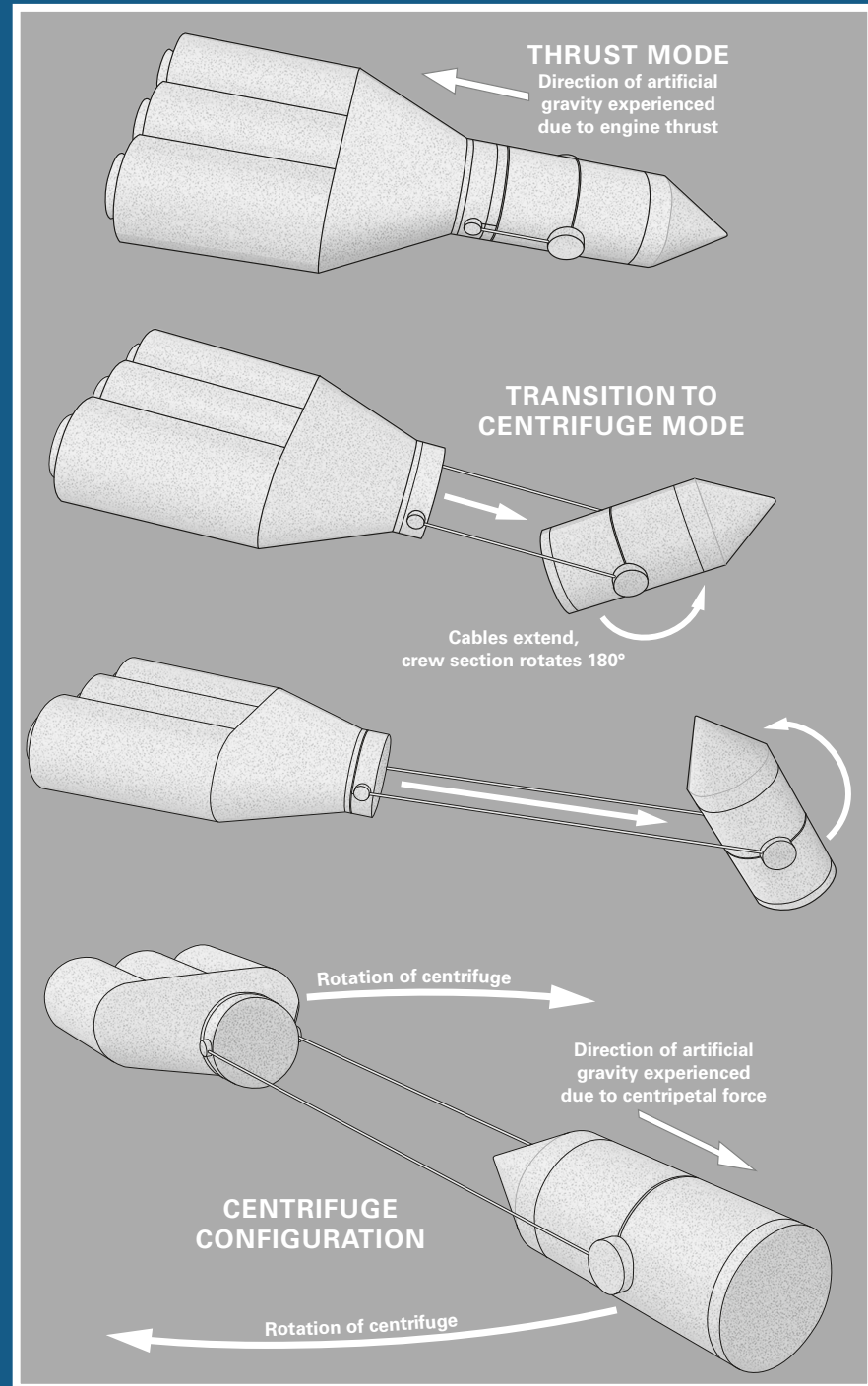


HAIL MARY SCHEMATICS





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ASTROPHAGE 101

WHAT IS ASTROPHAGE?

Astrophage is a single-celled organism that lives on the surface of stars. Like algae in the ocean, it doubles its population at regular intervals. Once our Sun is “infected” with this life form, the Astrophage population grows so large, so quickly, that the solar output of the Sun is reduced. And it will only get worse as time goes on. In effect, it is an algae-bloom on the Sun.

WHAT CAN IT DO?

Astrophage can propel itself with light and has very high energy storage capability. Just like a horse is more energy efficient than a truck, Astrophage is more energy efficient than a space ship. Astrophage is powering *Hail Mary*.

WHY IS IT A THREAT TO EARTH?

Astrophage is absorbing the Sun’s energy, making it so that Earth receives less sunlight which could drop the planet’s temperature, collapse food chains, wipe out animal species, and end humanity.

HOW CAN WE STOP IT?

We have sent the *Hail Mary* into space with three crew members. This is a research mission to investigate immunities to Astrophage, and to find answers to save our planet.



AN EXCERPT: CHAPTER ONE

“What’s two plus two?”

Something about the question irritates me. I’m tired. I drift back to sleep.

A few minutes pass, then I hear it again.

“What’s two plus two?”

The soft, feminine voice lacks emotion and the pronunciation is identical to the previous time she said it. It’s a computer. A computer is hassling me. I’m even more irritated now.

“Lrmln,” I say. I’m surprised. I meant to say “Leave me alone”—a completely reasonable response in my opinion—but I failed to speak.

“Incorrect,” says the computer. “What’s two plus two?”

Time for an experiment. I’ll try to say hello.

“Hlllch?” I say.

“Incorrect. What’s two plus two?”

What’s going on? I want to find out but I don’t have much to work with. I can’t see. I can’t hear anything other than the computer. I can’t even feel. No, that’s not true. I feel something. I’m lying down. I’m on something soft. A bed.

I think my eyes are closed. That’s not so bad. All I have to do is open them. I try, but nothing happens.

Why can’t I open my eyes?

Open.

Aaaand . . . open!

Open, dang it!

Ooh! I felt a wiggle that time. My eyelids moved. I felt it.

Open!

My eyelids creep up and blinding light sears my retinas.

“Glunn!” I say. I keep my eyes open with sheer force of will. Everything is white with shades of pain.

“Eye movement detected,” my tormenter says. “What’s two plus two?”

The whiteness lessens. My eyes are adjusting. I start to see shapes, but nothing sensible yet. Let’s see . . . can I move my hands? No.

Feet? Also No.

But I can move my mouth, right? I’ve been saying stuff. Not stuff that makes sense, but it’s something.

“Fffr.”

“Incorrect. What’s two plus two?”

The shapes start to make sense. I’m in a bed. It’s kind of . . . oval-shaped.

LED lights shine down on me. Cameras in the ceiling watch my every move. Creepy though that is, I’m much more concerned about the robot arms.

The two brushed steel armatures hang from the ceiling. Each has an assortment of disturbingly penetrative-looking tools where hands should be. Can’t say I like the look of that.

“Ffff . . . oooh . . . rrrr,” I say. Will that do?

“Incorrect. What’s two plus two?”

Dang it. I summon all my will power and inner strength. Also, I’m starting to panic a little. Good. I use that, too.

“Fffoouurr,” I finally say.

“Correct.”

Thank God. I can talk. Sort of.

I breathe a sigh of relief. Wait—I just controlled my breathing. I take another breath. On purpose. My mouth is sore. My throat is sore. But it's *my* soreness. I have control.

I'm wearing a breathing mask. It's tight to my face and connected to a hose that goes behind my head.

Can I get up?

No. But I can move my head a little. I look down at my body. I'm naked and connected to more tubes than I can count. There's one in each arm, one in each leg, one in my "gentlemen's equipment," and two that disappear under my thigh. I'm guessing one of them is up where the sun doesn't shine.

That can't be good.

Also, I'm covered with electrodes. The sensor-type stickers like for an EKG, but they're all over the place. Well, at least they're only on my skin instead of jammed into me.

"Wh—" I wheeze. I try again. "where . . . am . . . I?"

"What's the cube root of eight?" the computer asks.

"Where am I?" I say again. This time it's easier.

"Incorrect. What's the cube root of eight?"

I take a deep breath and speak slowly. "Two times e to the two-i-pi over three."

"Incorrect. What's the cube root of eight?"

But I wasn't incorrect. I just wanted to see how smart the computer was. Answer: Not very.

"Two," I say.

"Correct."

I listen for follow-up questions, but the computer seems satisfied.

I'm tired. I drift off to sleep again.

I wake up. How long was I out? It must have been a while because I feel rested. I open my eyes without any effort. That's progress.

I try to move my fingers. They wiggle as instructed. All right. Now we're getting somewhere.

"Hand movement detected," says the computer. "Remain still."

"What? Why—"

The robot arms come for me. They move *fast*. Before I know it, they've removed most of the tubes from my body. I didn't feel a thing. Though my skin is kind of numb anyway.

Only three tubes remain: an IV in my arm, a tube up my butt, and a catheter. Those latter two are kind of the signature items I wanted removed, but okay.

I raise my right arm and let it fall back to the bed. I do the same for my left. They feel heavy as heck. I repeat the process a few times. My arms are muscular. That doesn't make sense. I assume I've had some massive medical problem and been in this bed for a while. Otherwise, why would they have me hooked up to all the stuff? Shouldn't there be muscle atrophy?

And shouldn't there be doctors? Or maybe the sounds of a hospital? And what's with this bed? It's not a rectangle, it's an oval and I think it's mounted to the wall instead of the floor.

"Take . . ." I trail off. Still kind of tired. "Take the tubes out . . ."

The computer doesn't respond.

I do a few more arm lifts. I wiggle my toes. I'm definitely getting better.

I tilt my ankles back and forth. They're working. I raise my knees up. My legs are well-toned, too. Not bodybuilder thick, but still too healthy for someone on the verge of death. I'm not sure how thick they should be, though.

I press my palms to the bed and push. My torso rises. I'm actually getting up! It takes all my strength but I soldier on. The bed rocks gently as I move. It's not a normal bed, that's for sure. As I raise my head higher up, I see the head and foot of the elliptical bed are attached to strong-looking wall-mounts. It's kind of a rigid hammock. Weird.

Soon, I'm sitting on my butt-tube. Not the most comfortable sensation, but when is a tube up your butt ever comfortable?

I have a better view of things now. This is no ordinary hospital room. The walls look plastic and the whole room is round. Stark white light comes from ceiling-mounted LED lights.

There are two more hammock-like beds mounted to the walls, each with their own patient. We are arranged in a triangle and the roof-mounted Arms of Harassment are in the center of the ceiling. I guess they take care of all three of us. I can't see much of my compatriots—they've sunken into their bedding like I had.

There's no door. Just a ladder on the wall leading to . . . a hatch? It's round and has a wheel-handle in the center. Yeah, it's got to be some kind of hatch. Like on a submarine. Maybe the three of us have a contagious disease? Maybe this is an air-tight quarantine room? There are small vents here and there on the wall and I feel a little airflow. It could be a controlled environment.

I slide one leg off over the edge of my bed, which makes it wobble. The robot-arms rush toward me. I flinch, but they stop short and hover nearby. I think they're ready to grab me if I fall.

"Full-body motion detected," the computer says. "What's your name?"

"Pfft, Seriously?" I ask.

"Incorrect. Attempt Number Two: What's your name?"

I open my mouth to answer.

"Uh . . ."

"Incorrect. Attempt Number Three: What's your name?"

Only now does it occur to me: I don't know who I am. I don't know what I do. I don't remember anything at all.

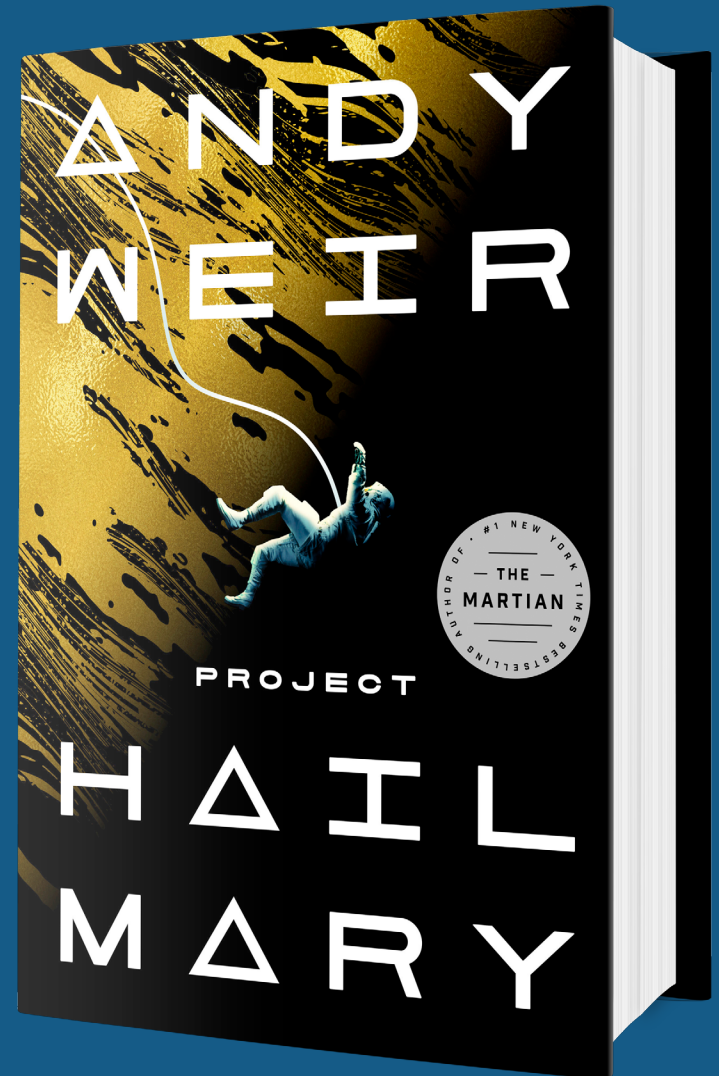
"Um," I say.

"Incorrect."

A wave of fatigue grips me. It's kind of pleasant, actually. The computer must have sedated me through the IV line.

". . . waiiit . . ." I mumble.

The robot arms lay me gently back down to the bed.



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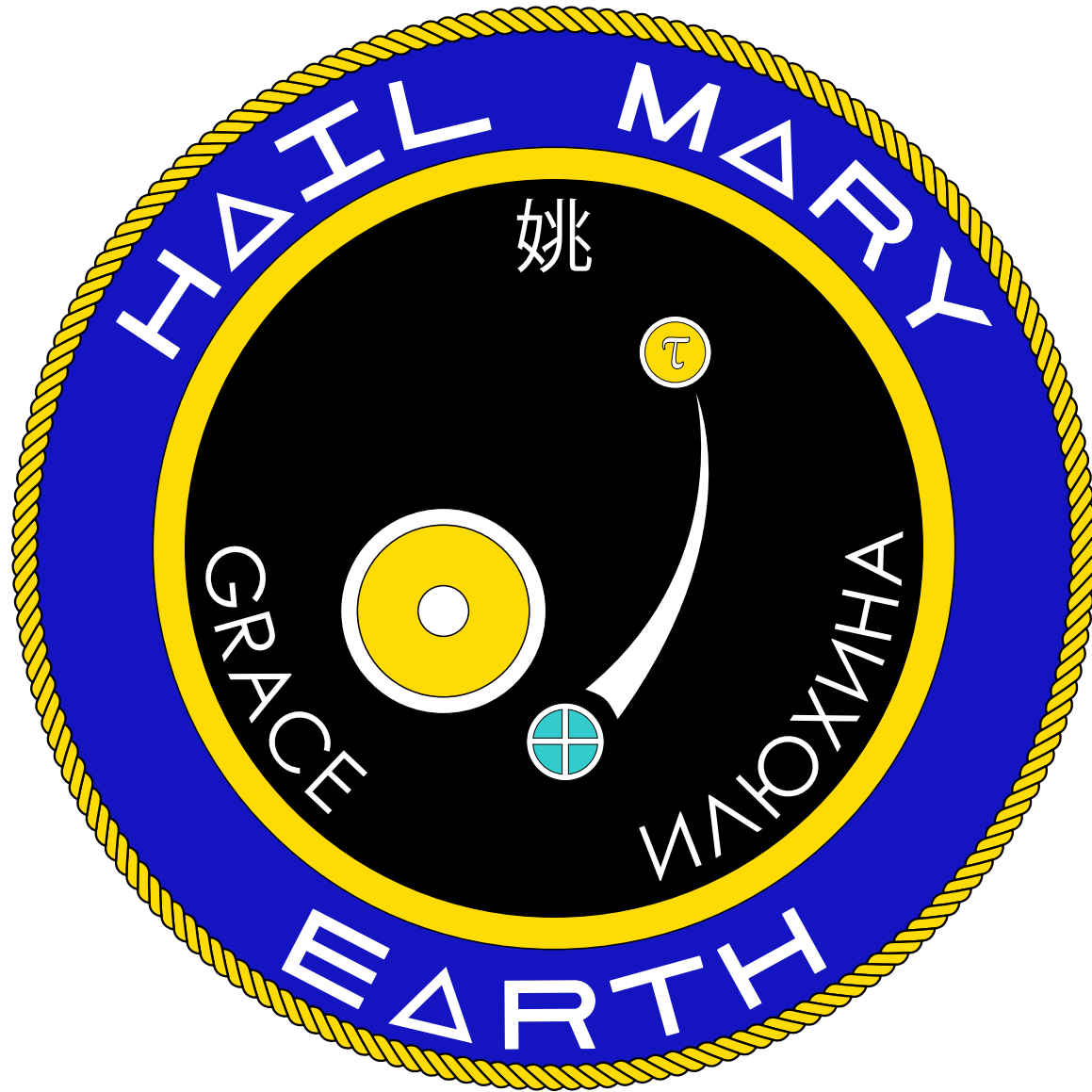
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