Podcast Transcript: *What the Future*
Dr. Future: [Pressing button] Say kids, what time is it? The future is coming on. It's coming on; it's coming. Hey folks, yeah, we're coming on to you from our Boulder Creek studio today in this wet weather—this kind of miserable weather in some people's mind. But I like it; I think it makes us go indoors and do fun things. Welcome to the show. Welcome, Mrs. Future.
Mrs. Future: Hi. I'm practicing pointing at you.
Dr. Future: Pointing at me.
Mrs. Future: There you are.
Dr. Future: That's you.
Mrs. Future: There's Bobby.
Dr. Future: There's Bobby. There's Bobby.
Mrs. Future: Let's see, which way is Bobby? Bobby, I have to point that way. Okay, there's Bobby.
Bobby: Hey, you guys. Here we go.
Dr. Future: Hey, it's like being the scarecrow in *The Wizard of Oz*. Yeah. So since we last talked, we've lost a couple more *Star Trek* folks.

Mrs. Future: Icons, yeah.
Dr. Future: Patrick Stewart, Captain Picard, and Chekov.
Mrs. Future: Two Chekovs.
Dr. Future: Well, the other Chekov has been dead for a while, I think.
Mrs. Future: Oh, okay.
Dr. Future: Yeah, that was the reboot Chekov. But the original, Walter Koenig, has passed.
Mrs. Future: Yes, the original. He passed.
Dr. Future: Yeah, good friends of Sulu.
Mrs. Future: Who's left? Kirk. Captain Kirk is left.
Dr. Future: The captain lieutenant ghost ship.
Bobby: Yeah, he's cruising.
Dr. Future: He's keeping it happening. By the time you watch this, the aging NASA telescope will have crashed to Earth.
Mrs. Future: Oh, yeah.
Bobby: The Swift.
Mrs. Future: The Swifties. The Swifties are all so close.
Dr. Future: That's right.
Bobby: Yeah, you know, they tried to save it, right?

Dr. Future: That's right, that's right.
Mrs. Future: Uh-huh.
Bobby: Yeah, NASA's Swift Observatory. It's expected to fall back to Earth probably tomorrow, after more than two decades of sending us information. It's a really cool telescope. It was designed to tell us about gamma-ray bursters.
Mrs. Future: Oh, right. And those are super, super bright, very short-lived spatial objects. And I believe they use them to detect gravity waves, right?
Bobby: They're used to detect the destruction of large stars. The satellite has three multi-wave telescopes. It collects visible light, which we all know and love, X-rays, and gamma-ray light. And it played a major role in looking at the universe in terms of rapid things that change, like gamma-ray bursters that only happen for a short period of time. It resides in a low Earth orbit close to our atmosphere. And sadly, it was too close because it began to fall out of orbit faster than NASA anticipated, mostly because of increased solar storms that have been going

on for the last couple of years.
Mrs. Future: So the orbital calculations were off because of all the solar storms. Too much solar wind.
Bobby: Yeah, sadly.
Mrs. Future: How long was it supposed to last?
Dr. Future: Probably not as long as two decades, which is what they wanted to extend its life to. You know, NASA has a way of saying, "Oh, it's only good for one year," but actually it works for dozens of years. And they're famous for that.
Bobby: And as a matter of fact, they wanted to extend this one. They had developed a booster—a five-link-tall spacecraft, a $30 million contract, kind of small for NASA, that was supposed to try to push it into a higher orbit.
Dr. Future: It's called a Link spacecraft, yeah. But it encountered issues.
Mrs. Future: Like a tugboat.
Dr. Future: Yeah, kind of a space boat.
Mrs. Future: Space tug, right?
Dr. Future: Right, to try to pull up a

government satellite that wasn't designed to be pulled. It had robotic arms that would grab it and then it would push it up to—I think they wanted to get it up to 370 miles. Multi-wavelength observations for two decades is an amazing body of information.
Mrs. Future: And they wanted to keep going with that.
Bobby: But this Link spacecraft, the $30 million contract to rescue it was just earlier this year. It failed because it didn't reach the observatory. It was not quite as successful a launch.
Mrs. Future: So there was a rescue mission that missed its mark.
Dr. Future: Right. It's a good idea; I think we should have tugs in space. I think that would be a good idea.
Mrs. Future: Yeah, sure.
Bobby: Meta, our favorite social media company, reportedly built a humanoid robot prototype that can do household chores.
Mrs. Future: Ooh, let's take a look at that.
Bobby: And as part of its push into robotics, they built a prototype that's meant to help out

around the house. Home robotics is their push. And according to our sources, the robot weighs about 106 pounds and is about one and a half meters tall—just over four feet tall approximately. It has a display that can show facial expressions, a built-in speaker, and hands that can pick up things. And it uses the Nvidia Jetson Thor chips to power it, according to the report. And what's interesting is Meta went with working with a Chinese company to build it.

Dr. Future: Yeah, it's codenamed Max 2, and it's designed to also have a projector on board.

Mrs. Future: Oh, well, every good robot needs to have a projector.

Dr. Future: Watch movies; they better know how to fire it up.

Mrs. Future: You got to show screens, right?

Dr. Future: Yeah, and they are trying to figure out how to make it climb stairs. Climbing stairs apparently is a tough job for robots. Now, what's interesting is that Meta acquired a startup fairly recently that's known for creating AI for robots.

Bobby: It's a company called Assured Robotic Intelligence.
Mrs. Future: Oh, yeah.
Bobby: ARI, yeah, a startup that's building AI for robotics.
Dr. Future: The Jetson Thor—last year you could have bought it for $3,000, and now it costs like $5,000 to buy a Jetson Thor.
Mrs. Future: Is that because of the shortage of AI chips?
Dr. Future: Not the AI chips, but the actual shortage of memory chips.
Mrs. Future: Memory chips, okay, even more basic.
Dr. Future: Yeah.
Mrs. Future: Wow.
Bobby: 80% of what you're paying for is just the memory. It's not the Thor chip; it's the memory you're paying for.
Mrs. Future: I mean, who could have predicted that it would be these commonly available type chips that would be such a shortage? Isn't that strange?
Bobby: They didn't anticipate all this AI demand and consumption that data centers

require. I can't believe how much memory the data centers require—it's crazy.
Mrs. Future: So the data centers are stripping out consumer need?
Bobby: They just shifted them over to the data centers instead of your gaming PC, you know.
Dr. Future: Maybe next year the prices of those chips might come down a little bit. And also in Texas, these gigafactories/terafactories are going to produce memory here too.
Mrs. Future: More memory!
Dr. Future: Now we need more memory.
Bobby: DeepMind unveiled the Genie world model. It promises more realistic physics and humans in virtual 3D space. This technology has sent gaming stocks tumbling because it's so good—it allows you to create a fairly sophisticated gaming-type world with just a prompt, without having to build the world using the typical 3D world-building tools, right?
Mrs. Future: That's amazing.
Bobby: I've seen people that are taking

agents and developing characters, and these agents are very intelligent and respond in real time. Just like when you ask AI a question or something, it responds very quickly. These agents are 3D models and they look real. You're creating your own game, but it is responding in real time. You can pick your own AI, so you can pick your own agents and then put them in this 3D gaming world, and these agents come alive in that world. These bots are responding just like AI would respond.

AI Agent Demo Audio: *"Our Q3 projections look very strong. Supply chains are fully optimized. Our AI infrastructure is scaling cleanly. Excellent work team, keep it up."*

Bobby: In real time they're acting out things; these are autonomous.

Mrs. Future: So they can create it on the fly?

Bobby: On the fly, yeah. And if you ask it a new question, it will respond.

Mrs. Future: Yeah, that's good. That ties in more into the concept of these story worlds that Brett Leonard likes to talk about.

Bobby: There you go, exactly what it is.

Dr. Future: And the story worlds won't just be for gaming, but they'll provide real movies. Like if you want to experience the American Revolution, you can go back there and hang out with George Washington and be there and experience some of the key moments in American history.
Mrs. Future: Yeah, when I heard about this, I was figuring that this is what a lot of these AI history storytellers are using—something that generates a world for the era of history they're telling the story about, and then they insert themselves as an avatar, as a character in that world.
Dr. Future: Yeah, you go in there and you're not just watching him cross the Delaware, but you're in the boat and you're asking him questions about his teeth.
Mrs. Future: Are they made of wood?
Dr. Future: Yeah, right! "Is that really true? Are there really Germans in New Jersey?"
Mrs. Future: Well, and it's interesting, this also ties in with something that Richard Craig was mentioning while we had coffee this morning about a patent that Disney has for

their animatronics characters. Their patent is for the recorded script of these characters that are acted out by people, say at Disneyland, to be provided by AI that are now going to have facial recognition for the actor who's inside the character, and they're also going to be able to recognize the person they're talking to and generate a whole conversation with them as an AI model would. The thing that's been going on with AI—the bot versus the real, authentic living being, right—and this has been going on since the early days of automated email and being able to tell the difference between something generated by a machine and something generated by a person.

Dr. Future: It's very different rules when you want a person to be in charge versus when you want an AI to be in charge.

Bobby: Right, right, yeah.

Mrs. Future: Which do they choose to listen to, too? Are we educating the AIs as well?

Dr. Future: They have to listen to us to learn how to be better at interacting with humans.

Mrs. Future: Well, we're all co-evolving

because intelligence is beyond our small definition of it for humans. Intelligence is the nature of the universe.

Bobby: Yeah, and DeepMind claims that this Genie technology can create infinite training environments for physical robots as well. So they can train your robot to do just about anything in a virtual environment so that it can be performed better in the real world.

Mrs. Future: A robot cannot tell the difference between a virtual environment and a real environment.

Bobby: Well, it doesn't need to; the two are the same.

Mrs. Future: Well, that's what I'm saying—it gets its experience virtually whether it's in a virtual world or in a real world.

Bobby: Because its sensors are turning whatever information it finds into virtual objects, and it's interacting with virtual objects.

Mrs. Future: One of my favorite movies illustrated this idea—I think it was called *FX*, right? And it was about a special effects robot designer who would actually control the robot

actor in the films as a special effects artist, so it's kind of having that relationship. And there's different kinds of avatars where the operator is inside the robot or the operator is somewhere else using the controls for the robot. These are all different kinds of designs.
Dr. Future: Well, I think the way Brett's visualizing it is that the actor or thespian has minute detailed control over the avatar to control facial expressions and voice. Like actors currently are limited to their own voice, but in the near future as a thespian, you'll be able to play with a whole host of voices.
AI Voice Demo: *"From the deep shadows of ancient stone, I command the silent. Oh, wait a minute, look at me now."*
Dr. Future: ...with the ability to have subtle control over their inflections and tone and emphasis and all the things that come with good acting and good voicing.
Mrs. Future: So an actor would basically want something that's the equivalent of a mirror watching them while they emote.
Dr. Future: Turning that into virtual acting.
AI Voice Demo: *"Speak spirit and let my*

command be heard. Rise from the dark shadows. Yo, wait a second. Is this Dr. Future actually working now?"
Dr. Future: Having a good digital mirror will be core for the actors of the future.
AI Voice Demo: *"Show more teeth. Perfect. Now look surprised. Excellent. That's it."*
Mrs. Future: This patent from Disney—what struck me is it kind of did something different. It used the actor inside to gauge what he or she was looking at, interpreted that information for the AI avatar, and then the AI was given the task of interacting with the person.
Dr. Future: Let's just do a shout-out to my current favorite AI movie studio; I think it's called AI Filmm.
Mrs. Future: Oh, yeah, and we've been watching these auto feeds late at night from your YouTube channel, I think.
Dr. Future: Yeah, AI Filmm has been doing these great epic history AI movies—narrative and educational movies of history unfolding in ways that have not been accessible before. Last night we got the history of Hannibal and

all of the 700 years of wars between the worshippers of Baal in places like Corinth in the ancient world and Rome, and Rome's diligence in always coming back again with their superior fighting force and how great skirmishes taught them certain lessons about how to fight.

Bobby: Yeah, I think they were doing the New World, Cortés and the Aztecs, for example.

Mrs. Future: Yeah, the whole history of South America that very few of us know—the Incas and the Spanish, the various rebellions and the various conquistadors, and what was happening with the king of Spain and the people representing the forces of Christianity in the heathen world.

Dr. Future: Yeah, the thing with them is they got the visuals. Real acting is still not happening yet in these worlds, but they're realistic in terms of the visuals with a voiceover narrative. So if you want to check it out, go to *Incredible History* on YouTube, and you can see some of these historical pieces that are coming out. Fantastic.

Mrs. Future: Yeah, you really get a

perspective of how far we've come, right? Dumb violence of this kind in this day and age, which was normal back then.
Dr. Future: We don't breed fighting machines, right?
Bobby: Yeah, I mean, we're making machines to do it for us.
Mrs. Future: But we're not impaling humans. We don't have humans throwing away their humanity in order to be part of a dominating force.
Dr. Future: Yeah, well, that was much more normal back then.
Mrs. Future: Well, one of the scenes that struck me in the movie is how in one of the cities of the ancient world, the warriors who were supposed to be really good with their David and Goliath tool—the mothers would put a piece of bread on a stick and ask the kid to practice with his stone-thrower to get the bread off the stick. So from the time they were little kids, they were being trained to be part of the army that would throw stones, right?
Bobby: Right. Well, you know, little boys like

shooting guns and bows and arrows, so it's kind of in the DNA, it seems. But as we get better at updating our biology, that could change too.

Mrs. Future: Now, there's nothing that's set in stone anymore, or set in DNA, I guess you might say.

Dr. Future: Well, and I think we're trying not to use physical pain as the force of civilization, even though it has been used extensively in the past.

Mrs. Future: Consciousness.

Bobby: Yeah.

Dr. Future: Yeah, and that's evolution; I think that's progress.

Bobby: How scientists have reversed 60 years of human aging, turning 80-year-old cells into 20-year-old cells—

Mrs. Future: In mice.

Bobby: Right, in mice, you're right.

Dr. Future: But look how closely mice track human physiology.

Mrs. Future: No, I'm just saying, they call them 80-year-old cells, but a mouse's life is how many years, right?

Bobby: It's not a big leap from mice to humans. It's reprogramming technologies, reprogramming cells, mRNA—all these things, once learned in mice and animals, can be applied to humans. It's really amazing.
Mrs. Future: Yes, so the idea is that if we could turn back the biological clock of an 80-year-old human cell and make it behave like someone younger than 20, that would be great. That's kind of the holy grail of reverse aging.
Bobby: So they imagine we could be 60 years younger by employing these molecular aging technologies, transforming blood cell precursors into neural stem cells that are capable of producing neurons. The University Hospital of Bonn and the University of Bonn—unlike the other methods before this where they reset a cell's molecular age relatively quickly, this approach works more gradually. It allows researchers to watch the rejuvenation process unfold over 100 days.
Mrs. Future: Wow. 100 days—so from 80 to 20 in 100 days. You can live with that, right?
Dr. Future: Yeah, yeah.

Mrs. Future: Well, I'm sure you can learn a lot.
Bobby: Yeah, it slows it down. Scientists are able to watch these mechanisms of reverse aging in more detail, and they can look at age-related diseases and see how they can reverse Alzheimer's. It looks like they're taking blood and rejuvenating the blood using transcription factors. It kind of reminds me what David Sinclair is doing in his phase one trial with humans.
Dr. Future: He's using Yamanaka factors.
Bobby: Yeah. And reprogramming the macula and also the nerve that has completely degenerated. In humans who are blind—because either from glaucoma or another disease, their nerve has degenerated and it's not there—they just microdose Yamanaka factors. And they only use three out of the four Yamanaka factors, so it regenerates them to when you were like 20 years old as opposed to when you were born with stem cells.
Mrs. Future: So do you consider that a parallel process to this?

Bobby: Yeah, yes. When they talk about transcription factors and it's epigenetic, it seems like it's a very similar approach to what David Sinclair is doing.
Dr. Future: I think David Sinclair has been doing this for at least six years now, and it has gone through phase one trials with humans. Yeah, this is with humans—they had done it with mice for 10 years, but now they've done it with humans.
Bobby: They're observing that the cells become significantly rejuvenated during the reprogramming process to turn red blood cell precursors into neural stem cells.
Dr. Future: This is very similar to Yamanaka, who got the Nobel Prize. What happens is a lot of the cells lose the memory of what they're supposed to be. These Yamanaka factors take an old cell and get it to move backwards in time. With Yamanaka factors, you can take old skin cells of a person—these won't be rejected because they're your cells, right—and they would regenerate them back to stem cells. David Sinclair says you don't have to go all the way back to a stem cell; you

just have to go to when the cells were 20 years old, right?
Mrs. Future: You just want to see them as adult cells.
Bobby: Yeah. And with that, theoretically, if you can do the macula in your eye and certain nerve cells, why can't you do that to every cell in your body? This technique will eventually allow anybody of any age to regress back to 20 or 30 years old.
Mrs. Future: Very interesting. It's actually just taking old cells that don't function at 100%—
Dr. Future: And just getting them to function when they were adolescent cells, right, when they were younger.
Bobby: Yeah, it's taking existing cells, and those cells can multiply and replicate too.
Dr. Future: According to Gemini, this German study builds directly on the foundational discoveries of Yamanaka and intersects with the core theories championed by David Sinclair, but it charts a distinct middle path in how cellular rejuvenation is achieved and studied. Yamanaka showed that mature cells could be reprogrammed back into an

embryonic-like state using four transcription factors, which resets the cell's epigenetic clock to zero, completely wiped cellular identity, and carried a substantial oncogenic risk. And so the German paper demonstrates that lineage redirection and epigenetic rejuvenation can occur together without forcing the cell back to a pluripotency state.

Bobby: The way David Sinclair was describing it, there are four Yamanaka factors, and David was concentrating on three of the four and microdosing the Yamanaka factors instead of full-on using all four and going all the way back to a stem cell. They were getting halfway there to make them young again.

Dr. Future: Yeah. And it was faster, too. The German approach is a slow-motion approach that takes 100 days to reduce the age, which has a certain advantage in studying the process in more depth to look at the cascade of epigenetic modifications that happen in those 100 days. So anyway, interesting research, I think, and thanks for tying it in with the Yamanaka factors, Bobby.

Bobby: Very rich, you know.
Mrs. Future: Yeah.
Bobby: 100 years from now, we're going to look at that and realize it wasn't always normal.
Mrs. Future: Slower routes to rejuvenation.
Bobby: 100 years from now, you're going to see only the people that select to be old will be here. Said, "Yes, I want to be old. Can I be 80 now?" I don't think a lot of people will choose that path.
Mrs. Future: Well, who knows? Maybe there's a certain kind of wisdom that happens with older cells that you don't get with young cells, especially if when you make them younger they forget everything—if there's a loss of identity or memory. You can be 20 again; you'll just have to start over with your thinking and who you think you are.
Dr. Future: Well, see, the reason I was talking about this idea of sixty—you were saying that you can take 60 years off, and I was like, well, I don't think I want to go back to being five.
Mrs. Future: No, no, too far! "Sonny, want a cookie?"

Dr. Future: So, thank you, Bobby, for being here. Appreciate your attention.
Bobby: Thank you for having me here. Always a pleasure to be with you guys.
Dr. Future: Yeah, you too, Bob, thanks. And I'm gonna have fun editing this.
Mrs. Future: Oh, boy!
Dr. Future: All right, well, what the future until then.
Mrs. Future: All right, bye.
Bobby: See you guys.